Precision Strike

Technology Symposium

Capabilities Required for Global Strike - Technology Implications for the Future

Laurel, MD

17-19 October 2006

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AGENDA FOR
PRECISION STRIKE TECHNOLOGY SYMPOSIUM
17-19 OCTOBER 2006

TUESDAY 17 OCTOBER:

THE LONG WAR: Brigadier General Mark O. Schissler, USAF
Deputy Director for War on Terrorism (J-5), The Joint Staff

OPENING KEYNOTE ADDRESS: Lieutenant General C. Robert "Bob" Kehler, USAF
Deputy Commander, U. S. Strategic Command
Presentation not approved for distribution

TARGETING SESSION: Chair: JT Morris—Whitney, Bradley & Brown, Inc.

- **Multi-Mode Precision Strike Weapons—The Answer for Mobile Targets: James J. Kuzmick**
  Chairman, Whitney, Bradley & Brown, Inc.
- **Joint Approach for Target Management for the Precision Strike of Time Sensitive Targets: Michael J. Woitalla**—Senior Systems Engineer, Raytheon Co.
- **3D Targeting for Enhanced Precision Strike: Bryan Pettitt**
  Senior Staff Research Engineer, Lockheed Martin Missiles & Fire Control
  Presentation not approved for distribution

USAF's GLOBAL STRIKE OPERATIONAL CONCEPT & REQUIREMENTS: Colonel Len Litton, USAF
Champion, Global Strike CONOPS, HQ USAF/A5XC-GS
Presentation not approved for distribution

GLOBAL STRIKE ACQUISITIONS—ALL THE PARTS: Greg Hulcher
Assistant to the Deputy Under Secretary of Defense (Acquisition & Technology), OUSD(AT&L)
Presentation not approved for distribution

ACCURATE SITUATIONAL AWARENESS ACROSS ALL DOMAINS—GROUND, AIR, SEA and SPACE:
John Landon-Deputy Assistant Secretary of Defense for C3ISR & IT Acquisition, OASD(NII)/DoD CIO
Presentation not approved for distribution

C4ISR SESSION: Chair: Buck Buchanan—JHU/APL C2 Program Area Manager

- **Enabling Effective Decisions: Jim Hillman—**JHU/APL, Group Supervisor Joint Command & Control Group
- **Joint Surface Warfare in the Littorals: Captain Matt Winter, USN—**Program Manager, PMA 201
- **Find, Fix, Track, Target, Attack & Assess Virtually Before Doing It For Real—Train As We Fight**: **Lt Col Donald Drechsler, USAF**—Commander 705 Exercise Control Squadron

WEDNESDAY 18 OCTOBER:

WEAPONS SESSION: Chair: Col (Sel) Jim Baker, USAF—OUSD(AT&L)/Portfolio Systems Acquisitions, Air Warfare Staff Specialist

- **Improved Technologies for Precision Strike Operations—Networked Edge Weapons Enabled by Data Links for Precision Strike: Jeffrey Gross-**Chief Engineer for Data Link Products, Harris Corp. *Presentation not approved for distribution*
- **Heterogeneous WDI Network Architecture and Performance: Greg Smith**
  Director of IDM Product Management and Engineering, Innovative Concepts, Inc.
  Presentation not approved for distribution
- **A MEMS Based, Deeply Integrated, INS/GPS Guidance, Navigation & Control Flight Management Unit for Emerging High G Applications: Michael J. Cook—**GPS/AJ Technical Director, Rockwell Collins, Inc. *Presentation not approved for distribution*

KEYNOTE ADDRESS—ARMY TRANSFORMATION: Honorable Francis J. Harvey—Secretary of the Army
Presentation not approved for distribution

COUNTERMEASURES:

- **Overview: Jim Tedeschi**—Director, Center for Countermeasures, White Sands Missile Range, NM
  Presentation not approved for distribution

- **Joint Mobile Infra-Red Countermeasures Test System: Robert Hunter**—IR Systems Team Leader, Center for Countermeasures, White Sands Missile Range, NM
  Presentation not approved for distribution

LUNCHEON ADDRESS—END GAME FOR GLOBAL WAR ON TERROR:
Lt Gen Thomas G. McInerney, USAF (Ret) Fox News Military Analyst
Presentation not approved for distribution

ROLE OF PROMPT GLOBAL STRIKE IN THE 21ST CENTURY: Dr. Frank Dellermann
Deputy Director for Strategic Strike, OUSD
Presentation not approved for distribution

DIRECTED ENERGY WEAPONS PANEL: (continued from Precision Strike Annual Programs Review to discuss classified-level perspectives): **Moderator: Dale Spencer**—New Business Technology, Manager, Kaman Aerospace Corp.-Fuzing Division

Government Perspective: Colonel John Costa, USAF-Joint Air Operations Officer
Presentation not approved for distribution
Industry Perspectives:
ATK: Dr. Anthony Castrogiovanni-VP Strike Weapons & Directed Energy
Presentation not approved for distribution
Northrop Grumman: Dr. Gary Koop-Director and Chief Engineer (ret)
Presentation not approved for distribution

The Boeing Company: Lee Gutheinz-Program Director for High Energy Laser/Electro Optical (HEL/EO) Systems for Directed Energy Systems (DES)
Presentation not approved for distribution

EFFECTS SESSION: Chair: Suzy Kennedy—JHU/APL Tomahawk Weapons System Program Manager

- **FASTLink: Dr. Alan R. England**—PM, FASTLink Program Mustang Technology Group, LP
  Presentation not approved for distribution
- **Vulnerability of Basements & Basement Bunkers to Precision Guided Munitions: Steve Proksch**—Intelligence Officer, Physical Vulerability Division, DIA
  Presentation not approved for distribution
- **Defining the "Precision Weapon" in Effects-based Terms: Major Jack Sine, USAF** Student, Naval Post Graduate School
  Presentation not approved for distribution

THRUSDAY 19 OCTOBER:

CURRENT OPERATIONS AND THREAT ASSESSMENTS: Chair: George McVeigh
Science Applications International Corporation (SAIC)

- **Nuclear Issues—How they relate to Precision Strike Requirements: Steve Henry** Deputy Assistant to the Secretary of Defense for Nuclear Matters
  Presentation not approved for distribution
- **Thermobaric Weapon: Glenn C. Baugher-**Defense Threat Reduction Agency (DTRA) Contractor *Presentation not approved for distribution*
- **Sensors Forward: Collaborative Sensor Networking For Global Strike: David Rosenblatt** Director of Advanced Systems, L-3 Communications, ComCept Division
  Presentation not approved for distribution
- **TLAM Communication Improvements: George Mayer**—Deputy PM (PMA-281)

FUTURE TARGETING PERSPECTIVE: John Liebsch—Director, Future Warfare Systems Office, National Geospatial-Intelligence Agency (NGA)
Presentation not approved for distribution

KEYNOTE ADDRESS: Honorable Michael W. Wynne-Secretary of the Air Force
Presentation not approved for distribution

TOP U.S. MILITARY CAPABILITY GAPS—MOST PRESSING MILITARY ISSUES:
LtCol Chuck "Tooba" Kelly, USMC—FAAD, Force Structure, Resources and Assessment (J-8), The Joint Staff
WARFIGHTERS' REQUIREMENTS PANEL—ANALYSIS OF COMPLETE KILL CHAIN AND KILL MECHANISMS: Moderator: Captain Jeffrey Cathey, USN—Strike Aviation Plans & Programs (N880C) *Presentation not approved for distribution*

- **Resources Perspective: Captain Jeffrey Cathey, USN—**OPNAV N88
- **Acquisition Perspective: Captain Matt Winter, USN—**Program Manager, Precision Strike Weapons Program Office (PMA-201) *Presentation not approved for distribution*

- **Joint Staff Perspective: LtCol Chuck "Tooba" Kelly, USMC**—FAAD (J-8)
  Presentation not approved for distribution
- **Kill Chain Analysis: Commander Anthony Wright, USN**
  Presentation not approved for distribution

Headquarters U.S. Air Force

Integrity - Service - Excellence

U.S. AIR FORCE

Directed Energy Solutions

Col John "JC" Costa

October 2006

UNCLASSIFIED BRIEFING

U.S. AIR FORCE

Overview

- **DE Effects**
- **Laser Advantages**
- **Types of Lasers**
- **RF Advantages**
- **Task Forces**
- **Offensive Roadmap**
- **Passive/Active Defense**
- **Advanced Tactical Laser**
- **DE Threats**

U.S. AIR FORCE

DE Advantages

- Effects Based Operations Redefine Precision
  - Destruction of Target May Not be Desired
  - Collateral Damage and Reconstruction Costs
- Allows for Targeting of Specific Component
- Graduated Effects
- Reduces Predictive ISR Requirement
  - Near Instantaneous Results
  - Stand-off capability

U.S. AIR FORCE

Laser Advantages

- **Extremely Precise**
- **Deep Magazine**
- **Rapid retargeting**
- **Self-defense**
- **Minimal Collateral Damage**
- **Graduated Effects**
- **Highly agile speed of light delivery**
- **Low incremental cost per shot**

U.S. AIR FORCE

Types of Lasers

- Chemical (THEL/ABL)
  - Power Derived from Chemical Reaction
  - Very Powerful – Large Footprint
- Solid-state (JHPSSL)
  - Electricity Passed through Crystal
  - Less Powerful - Smaller
- Free Electron
  - Tunable Electric Laser
  - Large Footprint
- Diodes
- Fiber

U.S. AIR FORCE

RF Advantages

- **All Weather**
- **Non-lethal**
- **Covert action is possible**
- **Low targeting, tracking, and pointing accuracies are required**
- **Protective measures are *not* readily available**
- **Reconstitution is easier**

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Task Forces

DETF Established Sep 2004

- 2-Star GOSG
- 75 DOTMLPF Action Items

EPTF Established Oct 2004

- DOD, DHS, DOT & DOJ

IUBIP Established Sept 2005

- OSD, JOINT, Services & DHS

U.S. AIR FORCE

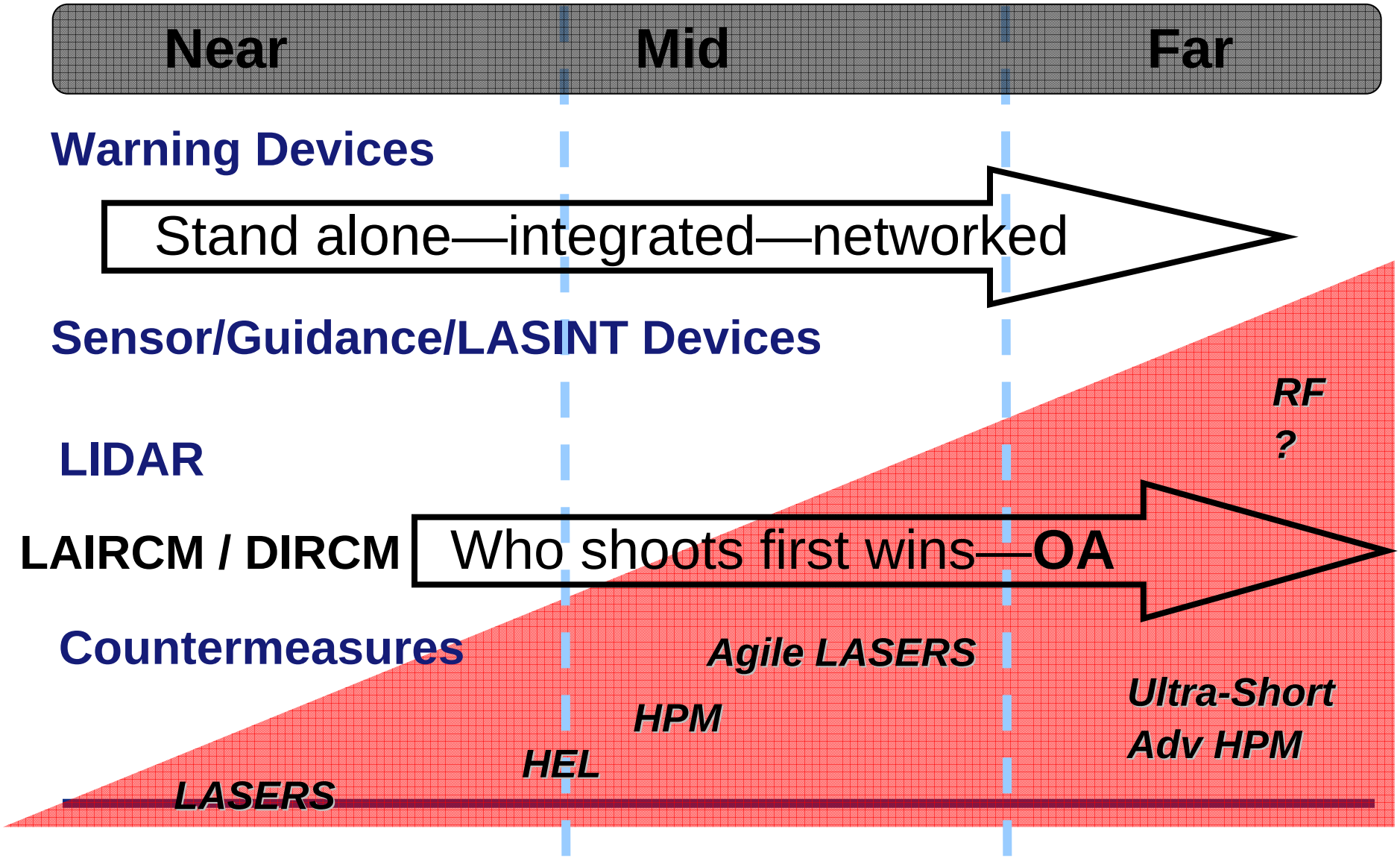
Offensive Roadmap

- Passive/Active Defense Development—Sensors
- Support Non-Lethal

- High Powered Microwave Munitions & Platform
- Force Protection
- Advanced Tactical Laser
  - ATL—DE Cornerstone

Passive/Active Defense

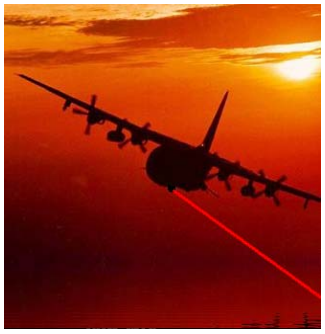
U.S. AIR FORCE



U.S. AIR FORCE

Advanced Tactical Laser

- **Fills QDR force requirements & CRRA gaps**
- **Potential to greatly lower:**
  - **Collateral Damage**
  - **Reconstitution Costs**
- **Provides new capabilities against targets**
  - **New effects & new targets can be engaged**
- **Path for rapid HEL employment--only mature program**
- **Lowers cost for future DE weapons**
- **Captures knowledge for Electric Lasers**
  - **Numerous components remain**



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ATL Answers

Integration

1. Weapon integration
2. System power and thermal control
3. Aircraft
4. Avionics and BMC4I

Laser device (COIL)

5. Resonator optics
6. Beam management
7. Power distribution and management
8. Cooling

Optical systems

9. Acquisition Tracking and Pointing (ATP)
10. Sensors
11. Beam Director
12. Beam director aero-optical effects

Beam Propagation Effects

13. Precision Engagement
14. Target / material interactions
15. Collateral damage effects
16. Weapon command and control

Operational concept

17. System capabilities / trades
18. CONOPS Modeling & Simulation
19. Mission planning
20. Master Test Plan / System Test & Evaluation

Logistics and support

21. Training
22. Infrastructure and logistic support
23. Reliability, Availability and Maintainability (RAM)
24. GSE & STE
25. Software

Knowledge & Components for
Electric-based Weapon
Substantial– 16 Elements
Some– 9 Elements
Little or none– 0 Elements

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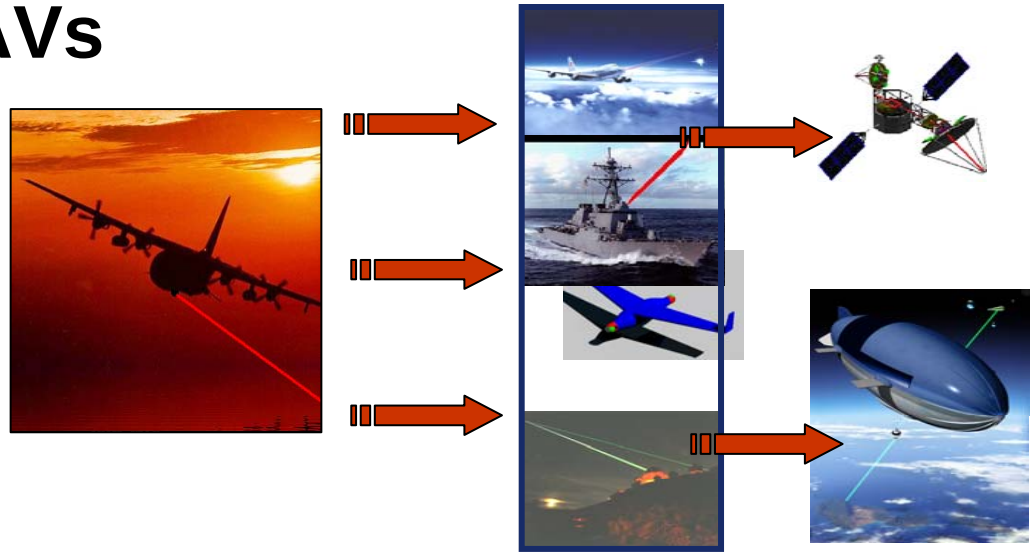
ATL is High Energy Laser (HEL) Cornerstone

- Effects analysis (target vulnerability)
- Counter IED & UAVs
- ISR (LIDAR)
- Bomber defense
- Tactical defense
- Ground attack



- Collateral damage assessments
- Exploitation of non-lethal to lethal capability

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DE Threat

- DE Denies Full Kill Chain-Even at Low Power Levels
  - Find, Fix, Track, Target, Engage & Assess in Air or Space
- Threatening Devices Available Today
  - Use: non-State actors or US civilians
  - Future: more power, smaller and agile
- NEED SPEED OF LIGHT TO FIGHT SPEED OF LIGHT
  - Requirement to find them first

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Summary

- **Effective laser weapons are already under development and testing**
- **Integration into land, sea, air and space platforms eased by technology advances**
- **Operational concepts must be developed to guide investment and effort**

Headquarters U.S. Air Force

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DETF SIPR Website:

http://www.a3a5.hq.af.smil.mil/a5r/a5re/docs/directedenergy.htm

EPTF SIPR Website:

http://www.a3a5.hq.af.smil.mil/a5r/a5re/docs/eyeprotection.htm

505th Command & Control Wing

Gateway to Operational Level Command

Distributed Mission Operations

Lt Col Don "Drex" Drechsler

Commander

705th EXS, Kirtland AFB, NM

(USAF DMOC)

This Briefing is:

UNCLASSIFIED

Overview

- Distributed Mission Operations
- Virtual Flag Overview & Lessons Learned
- Growing Role of DMO Exercises
- Other Roles of DMO

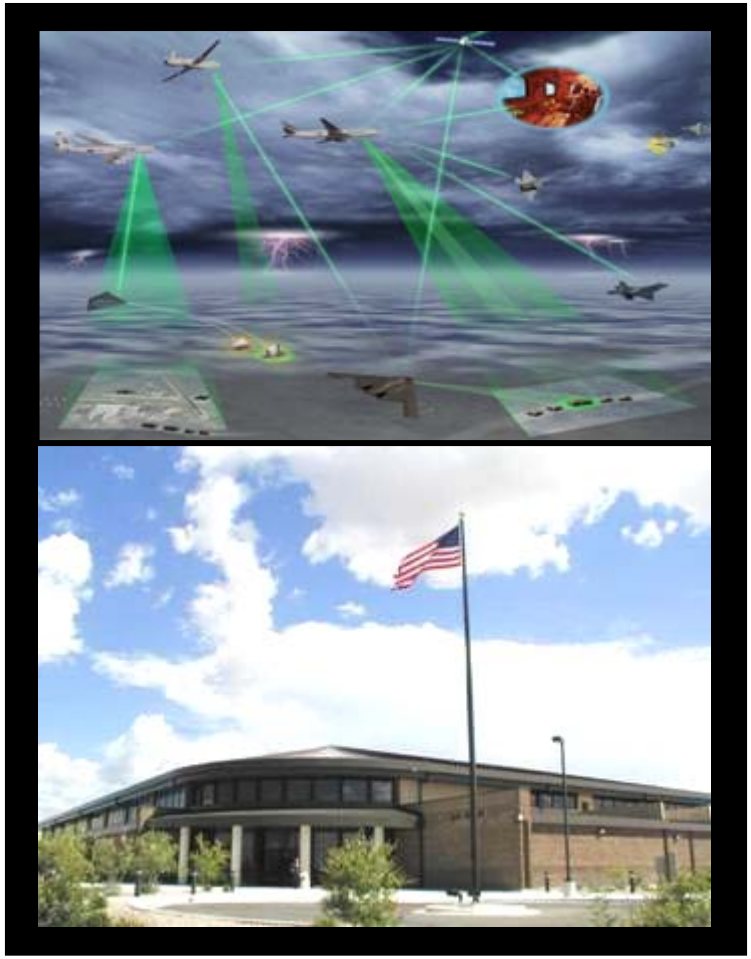
Chain of Command

Air Combat Command
Gen Keys

USAF Warfare Center
Maj Gen Worden

505 CCW
Col DiFronzo

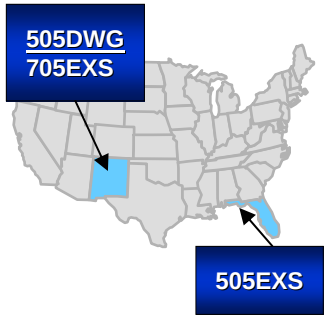
505 DWG
Col Moskal



Gateway to Operational Level Command

505th Distributed Warfare Group

Kirtland AFB, NM



Mission

Provide high-fidelity theater synthetic battlespaces and world-class exercise control to support joint distributed warfighter training, testing and experimentation across the operational and tactical levels of war

Key Programs

- **Distributed Mission Operation Center (DMOC)**
- **BLUE FLAG, VIRTUAL FLAG**
- **USAF Professional Control Force**

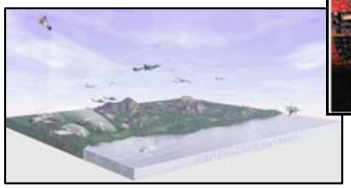
Distributed Mission Operations

- **DMO is a CSAF-directed readiness initiative**
  - **Train warfighters and build mission rehearsal capability**
  - **Tie C2 & ISR to the shooters**
  - **Mix/match Live-Virtual-Constructive to meet training objectives from tactical to operational levels**
  - **Link geographically separated simulation centers**
  - **Link across AF, Joint, & Coalition**
- **DMO is an Integration, Training, and Testing Effort!**
  - **Integrate existing, emerging programs, processes, technologies to evolve DMO Capabilities**

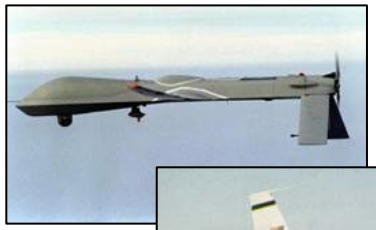
DMO Provides the Major Component of Training Transformation for the AF (CSAF, 7 Jan 03)

DMOC Simulators

- F-15 C/E
- CRC
- J-STARS
- Cobra Ball
- AWACS
- Patriot / JSWS
- UAV

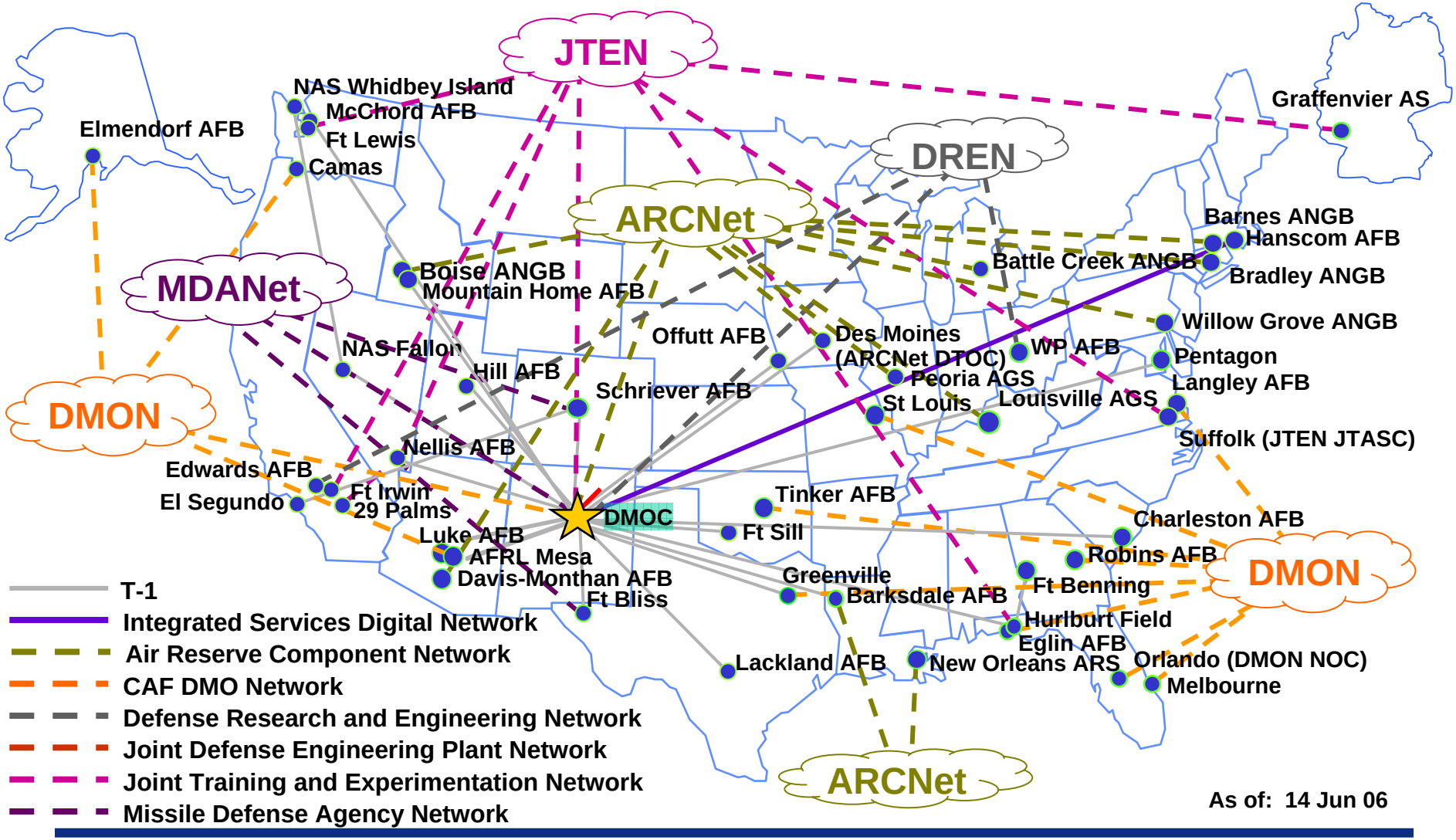







- Threat & Scenario Generators
- F-22
- F-16 RTC

DMOC Accessible Networks



Gateway to Operational Level Command

Exercise VIRTUAL FLAG

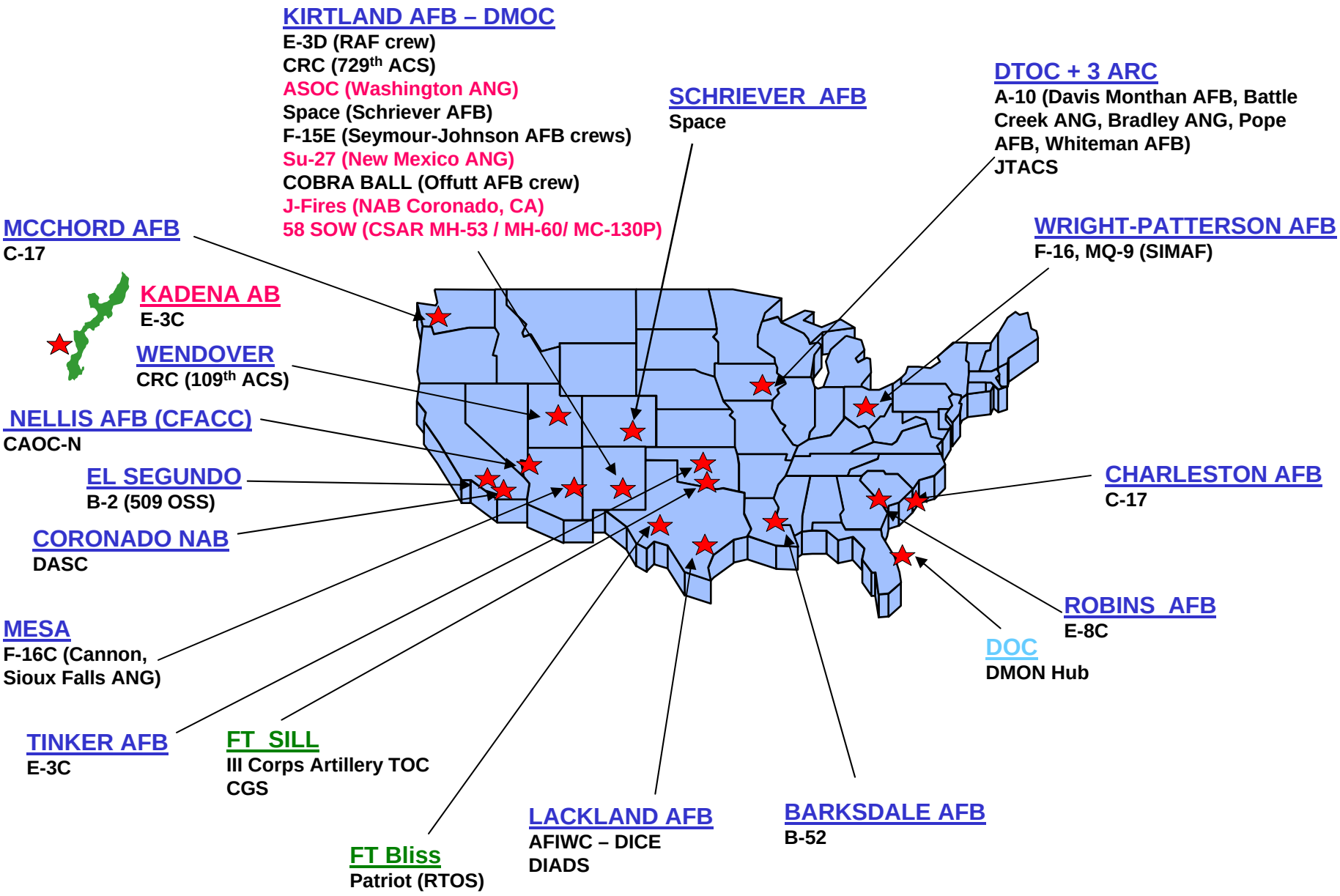
- Large Force Combat Employment Exercise in a virtual battlespace

- Similar to Red Flag format, but "larger"
  - 250 - 400 participants (20+ locations)
  - Warfighters participate from worldwide locations
  - Requirements: Simulator + network + DMO capability

- 2 week exercise period
  - 1 week – academics & integration testing (decreasing requirement)
  - 1 week – execution (Fam Day + four days of 3-4 hr vul period/day)

- Scenarios → AEF Preparation
  - Range space is virtually unlimited
  - Theater-specific mission planning documentation (SPINS, ATOs, ROE)
  - Real world threat presentations (A/A, A/G, IO)

Typical Virtual Flag

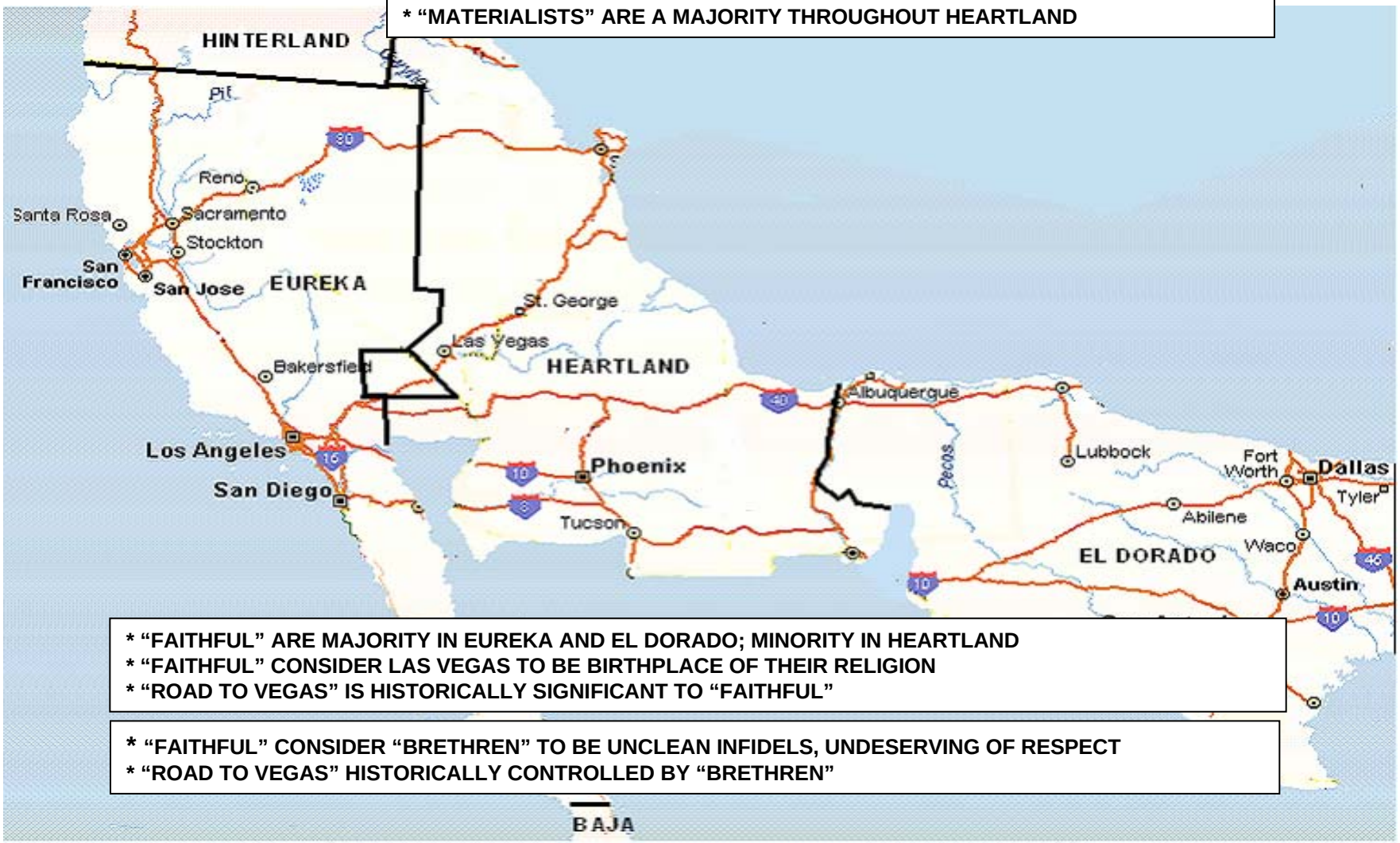


06-3 (26-29 Jun 06)

Typical VF Academics

- 2 days of Academics (at Kirtland and via VTC)
- MWS Capabilities/Limitations
  - Sim difference training
  - Includes CAOC & Operational-level of War training
- CSAR
  - TTPs and PRC-112 operations
- Package Commander Duties and Responsibilities
- Dynamic Targeting (DT)
  - Roles and responsibilities of each MWS

SOUTHWEST USA SCENARIO



Virtual FLAG 06-3

- **SW USA Scenario**
- **New Capabilities**
  - **J-Fires**
    - Real-time coordination for Joint Kill Box procedures
  - **Digital CAS Interface**
    - Machine to machine interface – ASOC to JTAC tasking/reporting via TACP CAS Software
  - **DMOC Su-27**
    - First time configuration of F-16 simulator as Su-27
  - **Aggressors (Nellis)**
    - Beginning linkages with Red Flag Aggressor squadron

Virtual FLAG 06-4

- **SW USA Scenario**
- **New Capabilities**
  - **Red Tactical Voice**
    - Joint EP-3/RIVET JOINT capability to simulate tactical Red Air
  - **Minot B-52**
    - First time for integration and participation for this facility. Fly in formation w/Barksdale (2-ship).
  - **Dyess B-1**
    - First time run of B-1 from new DMO-equipped facility at Dyess
  - **IFACT Helmet-Mounted Sight**
    - Pre-cursor to JTACS-dome – first test within VF of helmet-mounted 360° view
  - **AFRL/Mesa** – Tested a new network (DMO) monitoring tool

VF 6-4 Numbers

- **People Trained: 356 Total**
  - **USAF: 207**
  - **USA: 104**
  - **USN/USMC: 18**
  - **RAF: 27**
- **DMOC Sorties Flown: 33 (162 hrs, 93 participants)**
- **Distributed Sorties Flown: 88 (446 hrs, 263 participants)**

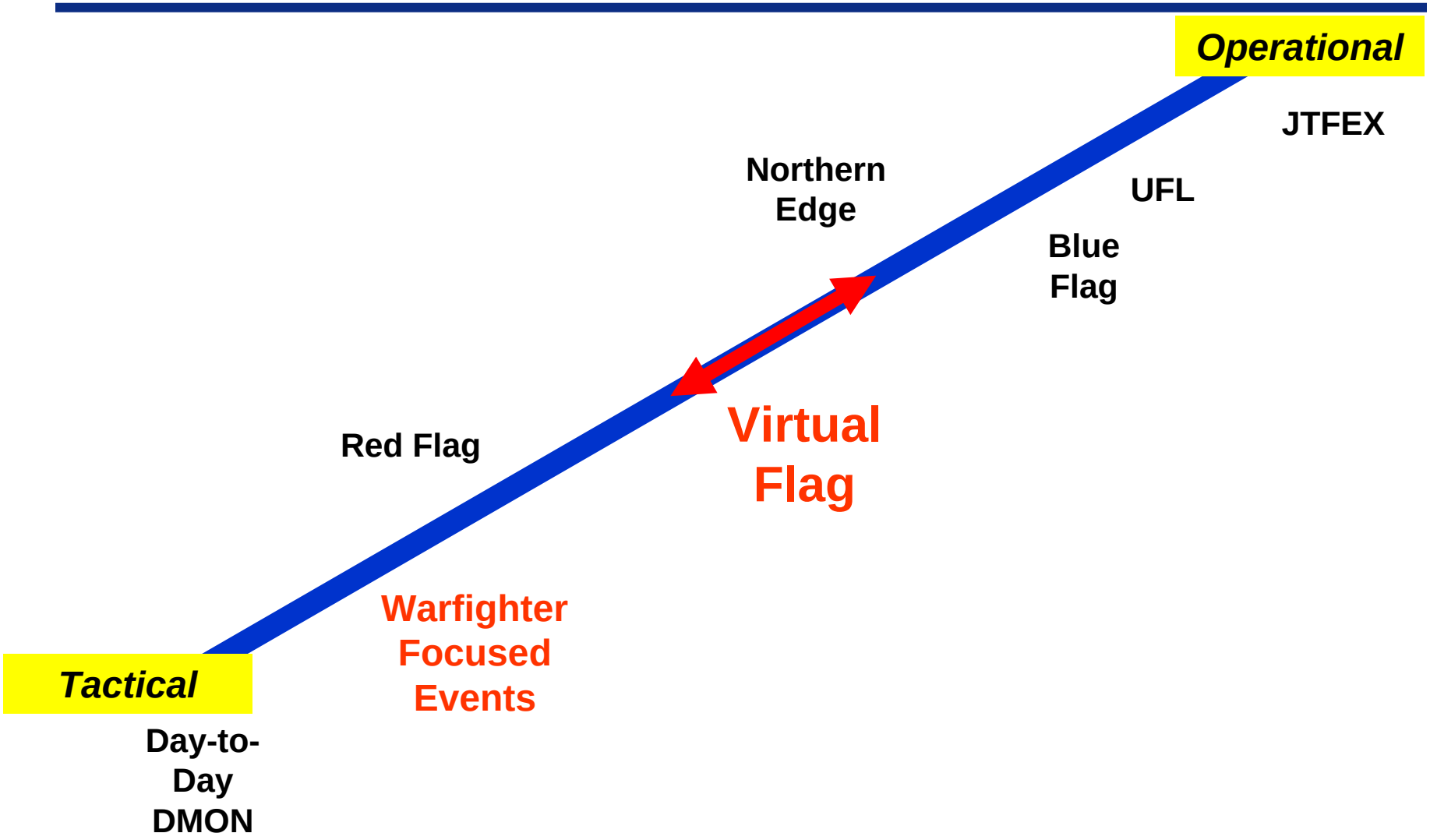
VIRTUAL FLAG 06-4 Results

- B-1 participated from home station (Dyess AFB) for the first time
- C-17s successfully integrated
- Navy E-2C returned, four crews trained – logged NAVY RAP reqs
- Tactical Red Voice-emulator tested successfully for aircrew training
- E-3C / E-8C / B-1 / B-52 logged RAP reqs
- B-52 USAFWS Upgrade Mission Commander training
- ADAFCO / USAF JICO identified discrepancies in LINK mgmt
  - False positive EIDs of Blue Air tracks
- CAOC Operations floor integrated and trained via CAOC-N

VIRTUAL FLAG Lessons Learned

- **Training is valuable even with low-fidelity sims**
  - **Integrate high to low fidelity sims . . . Tactical Training!**
  - **Exercise the entire Theater Air Control System**
- **Integrating Operational and Tactical level (AEF)**
  - **Great training for CAOC and tactical level participants**
  - **More needs to be done - common databases & EGs**
- **Still many technical hurdles to overcome in integration**
  - **Low & high fidelity sims - lack of DMO standards**
  - **No such thing as "plug and play" . . . not yet**
  - **Need a Maytag, DMO-experts, and professional WF**

DMO Training Spectrum



Warfighter Focused Events (WFEs)

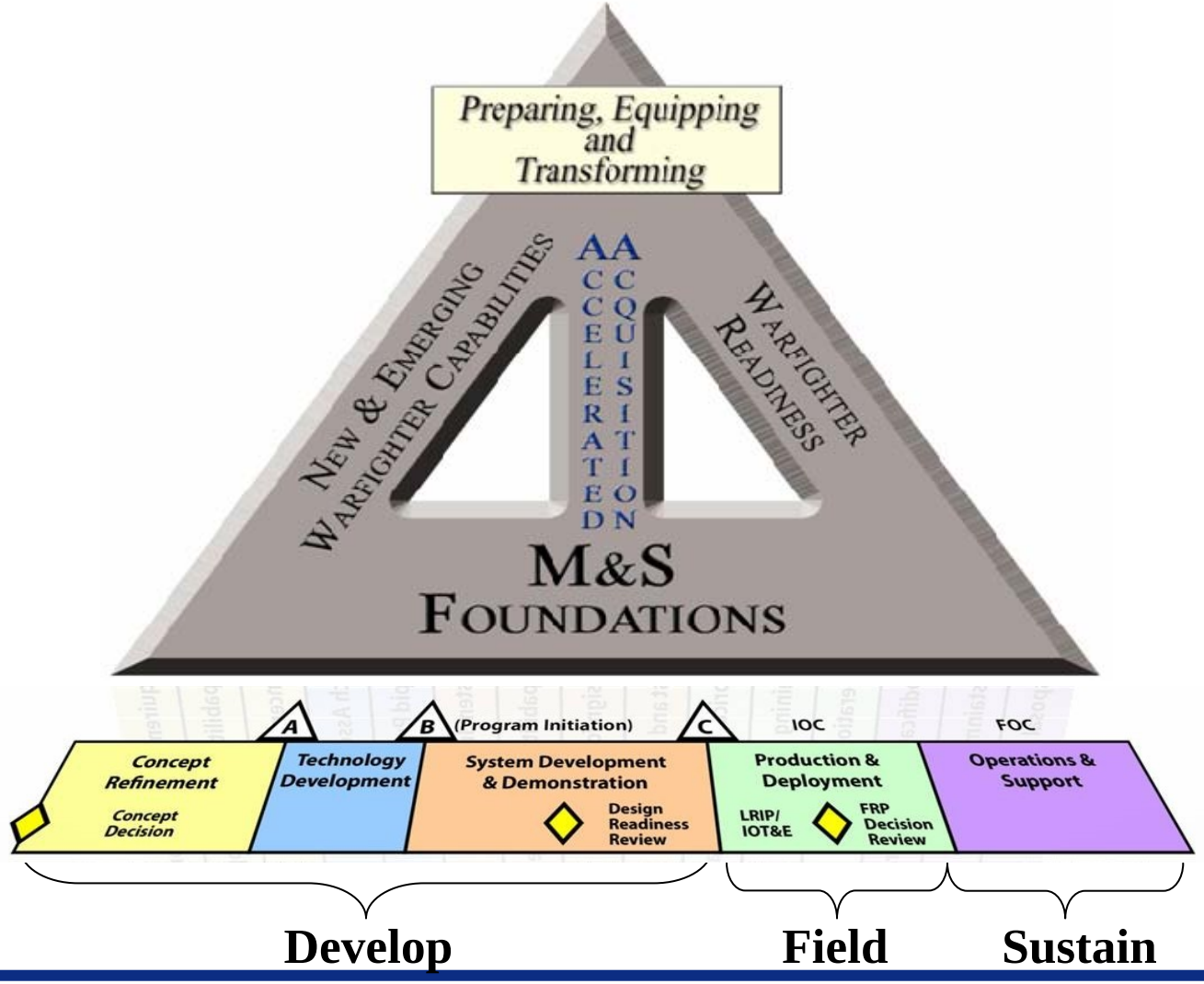
- Training focused tactical warfighter
  - Focused on a specific task/event
- 10-25 Participants (5-7 Weapon Sys), small White Force
- Build "On-the-shelf" training missions
  - Can be varied – dial up/down intensity/constructives
- Frequency: Eventually weekly

■CSAR	■CAS	■DCA-Patriot	■SOF
■XINT	■TST/DT	■Airfield Assault	■IADS takedown
■SEAD/DEAD	■Pipeline Protect	■Urban CAS	■DCA (J-kill chain)
■OCA	■NEO	■WMD Strike	■Others . . .

On the horizon . . .

- **Longer Term Virtual Flag development**
  - **MCO**
  - **AEF / GWOT**
  - **HLD**
  - **Rapid Mission Rehearsal**
- **<u>Many Longer Term Pieces (Missing)</u>**
  - **Databases (for at least five potentially hot areas)**
  - **Scenario Generation, EGs, IO, EW, etc.**
  - **Training Requirements**
- **LVC Integration**
  - **Incorporating Virtual/Constructive into Red Flag (Live)**
  - **Incorporative Live into Virtual Flag**

Air Force M&S Thrust Areas



DMO Test Event (IAMD) Execution

- **IAMD: Distributed exercise consisting of 4 sites**
  - **Distributed Mission Operations Center (DMOC)**
  - **Virtual Warfare Center (VWC)**
  - **Joint National Integration Center (JNIC)**
  - **Elmendorf AFB, AK**

- **<u>Scenario</u>: Persian Gulf (missile launch)**
  - **Ten vignettes**
    - **Increasing in type and intensity of threats**
  - **Final vignette consisted of multitude TBMs, cruise missiles, and aircraft threats**
    - **Prioritizing the threats was the emphasis on this vignette**

DMO Test Event (J-Fires)

- **Joint Fires Coordination Measure (JFCM)**
  - **Tested pre-developed procedures to replace existing joint kill box operations**
  - **Test conducted during VF 06-3 (June 2006)**
  - **Highly successful event**
    - **100% of data capture requirements**
    - **Multitude of joint major weapon systems**
  - **Follow-on event will be tested in a “real world” theater**

Joint Kill Chain Event (JKCE)

- JNTC funded: Provide training in a Joint Environment
- Grew out of Lessons Learned from OIF
- Goal: Minimize fratricide incidents
  - Coordinate air tracks to ensure PATRIOT missiles are targeting the correct entities
- Air Force CRC, Army ADAFCOs, and PATRIOT units

Advanced Concepts

- **Joint Air/Ground Operations: Unified, Adaptive Replanning (DARPA)**
  - Dynamic semi automated ATO generation
  - Testbed for CONOPS development
- **Airborne Laser (ABL SPO)**
  - Prototype Tactical and Weapon Displays (Warfighter in the loop)
  - TADIL-J capability
- **F-16 High Energy Laser Fighter (AFRL)**
  - Tactical laser
  - Evaluate design parameters and utility
- **Advanced Concepts Event (AFRL)**
  - CONOPS development
  - Mission tactics, C2
  - Survivability/lethality of advanced systems

Few thoughts to leave you with . . .

- DMO brings realistic training unavailable except in combat
  - Real world scenario & full-array of threats
  - Size of the training range is virtually unlimited
- Early integration and testing of new technology and TTPs
- DMO brings training w/lower costs
  - Aging airframes, rising flying hour costs
- Integrate tactical through operation level of combat
- Challenges:
  - Expand number of USAF, Joint, Coalition, external (DMO Campus)
  - Brief / Debrief tools in the distributed environment
  - Change in aviator culture (understood by younger generation)

Questions

MISSION REHEARSAL

INTEGRATION **SCHEDULING**

TRAIN ***EXPERIMENT***

SCENARIOS **REPOSITORY**

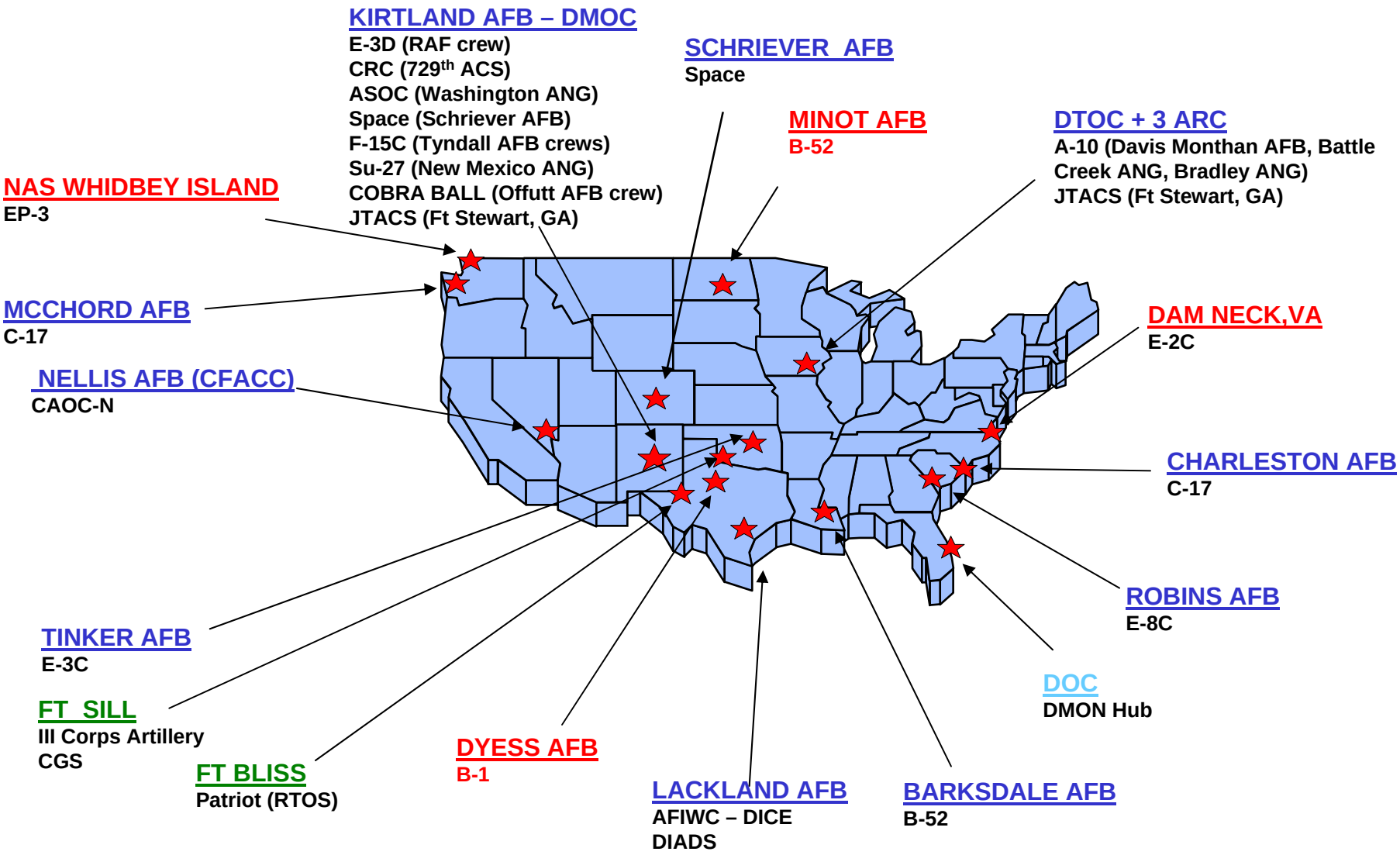
TEST

RANGE INTEGRATION ***DECISION SUPPORT***

Virtual Flag Dates

- VF 7-1
  - 30 Oct – 2 Nov 06
- VF 7-2
  - 19-22 Mar 07
- WFEs
  - Beginning NLT Apr 07
- VF 7-4
  - 16-20 Jul

VF 6-4 PARTICIPANT LOCATIONS



Enabling Effective Decisions

Tom “Buck” Buchanan - C2 Program Area Manager, Precision Engagement Business Area
Tim Galpin - Business Area Executive, Infocentric Operations
Jim Hillman - Joint C2 Group, Warfare Analysis Business Area
Bob Leonhard - National Security Analyst, National Security Analysis Department
John Nolen - Principal Professional Staff Analyst, National Security Analysis Department

Outline

- Purpose
- Background
  - Key definitions
  - Operational Environment
- JHU APL C2 Concept
  - Features
  - Advanced Situational Awareness/Knowledge
  - Decision Making
  - Planning
  - Execution
- Summary

Why JHU APL Developed a Command Concept

- To inform and focus the Lab's research and development efforts
- To offer hypotheses for testing and experimentation
- To facilitate further collaboration with the larger defense community

Key Definitions

- **Command: The authority that a commander in the armed forces lawfully exercises over subordinates by virtue of rank or assignment. Command includes the authority and responsibility for effectively using available resources and for planning the employment of, organizing, directing, coordinating, and controlling military forces for the accomplishment of assigned missions.**
- **Control: …the regulation of forces and battlefield operating systems to accomplish the mission in accordance with the commander's intent.**
- **C2 System: The arrangement of personnel, information management, procedures, and equipment and facilities essential for the commander to conduct operations.**
- **Operational Environment: A composite of the conditions, circumstances, and influences that affect the employment of military forces and bear on the decisions of the unit commander.**

The operational environment is what it is, not what we want it to be—and it will change

- Decision Makers must address opposing considerations – often within the same conflict, campaign, or moment in time
  - Conventional warfare v. unconventional warfare
  - Hierarchy v. anarchy
  - Centralized control v. decentralized control
  - Concentration of forces v. dispersion of forces
  - Knowledge v. ignorance (certainty v. uncertainty)

Conventional Warfare v. Unconventional Warfare

Conventional Warfare

- Conventional forces
- Defined combatants
- Linear battlefield
- Terrain objectives

Examples:

- Desert Storm, 1991
- Iraqi Freedom, 2003
- …but each had <u>unconventional</u> components

Unconventional Warfare

- Irregular forces
- Undefined combatants
- Non-linear battlefield
- Non-terrain objectives

Examples:

- Enduring Freedom, 2001
- Iraqi Insurgency, 2003-5
- …but each had <u>conventional</u> components

Desert Storm | OIF | Panama 89 | Kosovo 99 | OEF | Iraqi Insurgency | Global War On Terror

Conventional **Unconventional**

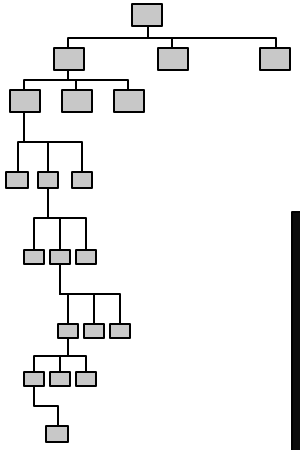
Hierarchy v. Anarchy

Hierarchical relationships

- Senior
- Subordinate
- Supporting
- Supported

"Anarchical" relationships

- Coalitions
- Cooperation across organizations
- Liaison with central or local officials
- Ties with national or local religious or tribal organizations
- …



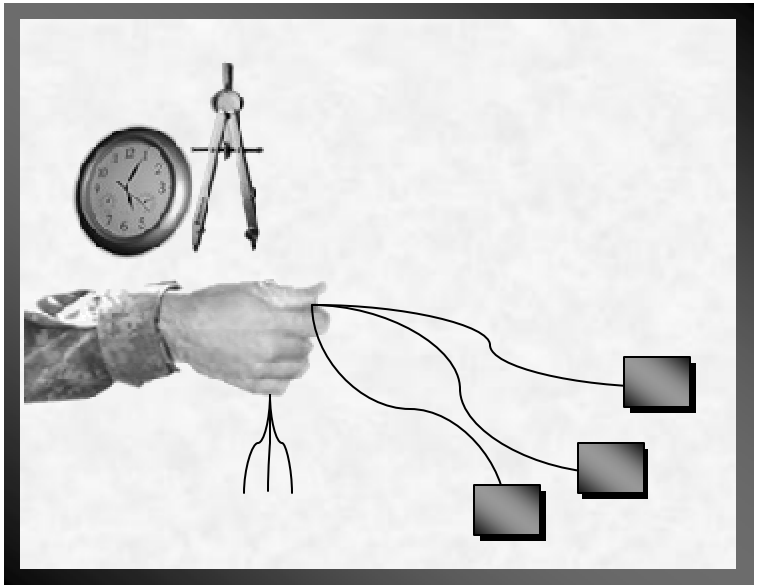
Panama 89 | Desert Storm | OIF | OEF | Iraqi Insurgency | Kosovo 99 | Global War On Terror

Hierarchy — **Anarchy**

Centralized Control v. Decentralized Control

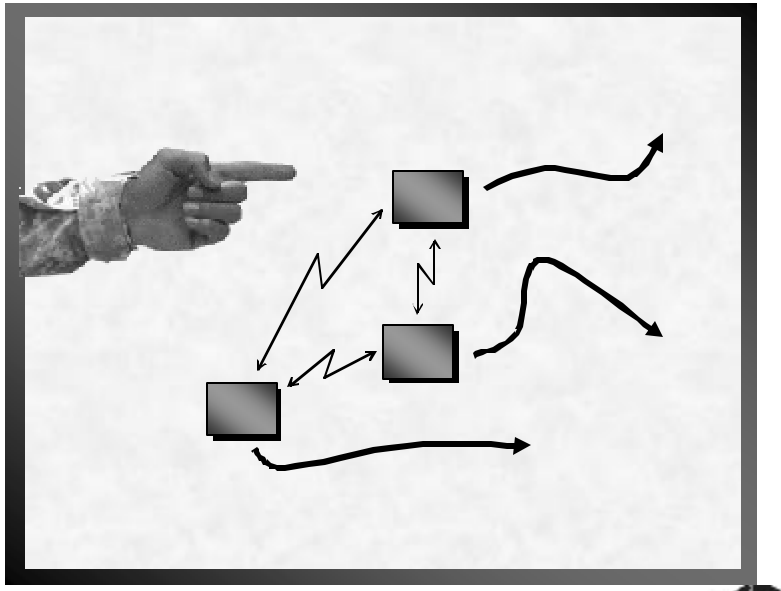
Centralized control

- TPFFD execution
- Air Tasking Orders
- Air Defense Zones
- Bandwidth allocation
- Rules of Engagement
- …



Decentralized control

- Commander's intent
- Mission orders
- Areas of Operation
- Self-defense
- Subordinate initiative
- …



Concentration of Forces v. Dispersion of Forces

Concentration of forces

- Focus combat power
- Seize key objectives
- Take decisive action

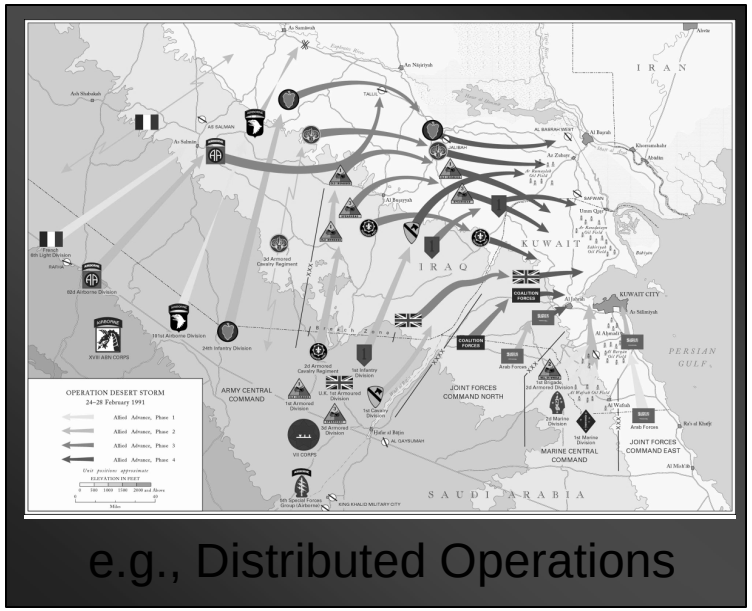
e.g., Airland Battle

Examples:

- Main attack, Desert Storm
- Faluja, Spring 2005

Dispersion of forces

- Control more area
- Reduce target profile
- Hide intent



e.g., Distributed Operations

Examples:

- Afghanistan, 2001
- Iraqi Insurgency

Knowledge v. Ignorance: Decision Makers Must Act with Imperfect Information

Knowledge

- Drawn from credible information about
  - Friendly forces
  - Enemy forces
  - Terrain & weather
- Acquired from many sources

Examples from OIF:

- Friendly strength
- Enemy weapons
- Enemy tactics
- Terrain analysis
- Weather forecasts

Ignorance

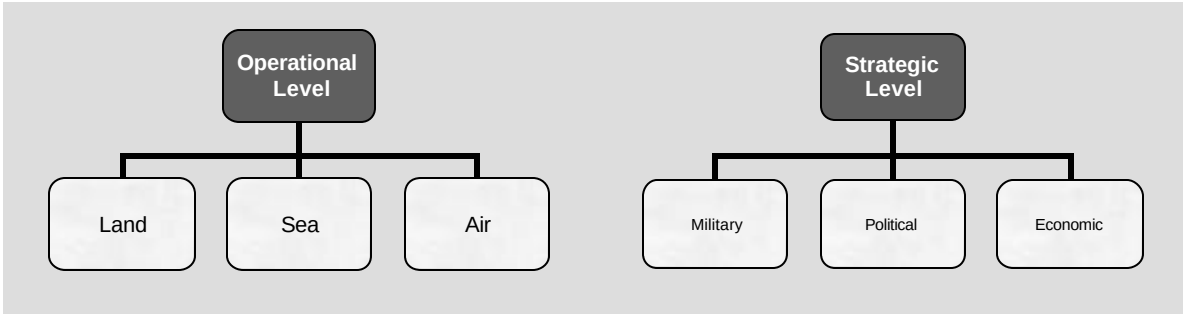
- Unacquired information
- Incorrect information
- Misinformation

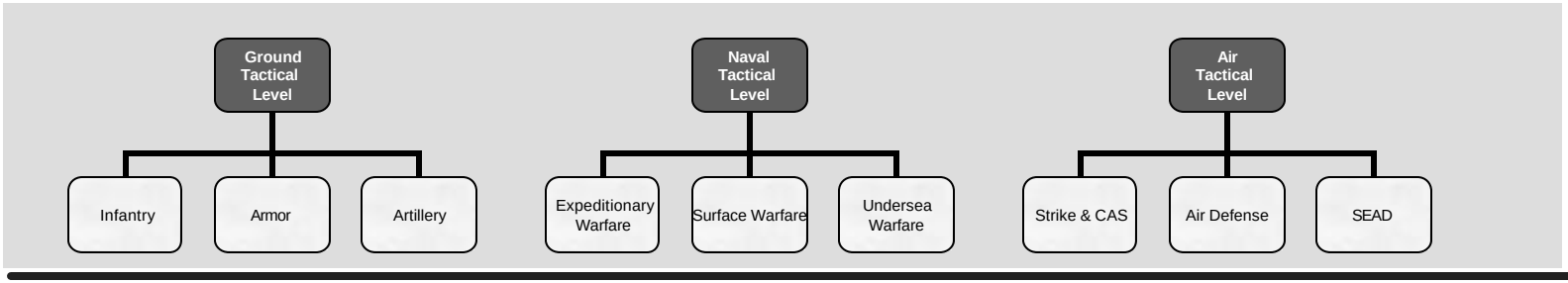
Examples from OIF:

- Hussein's location
- Absence of WMD
- Persistence of Baath militias and irregulars
- Delays caused by sand storms

Decision Makers at Different Levels Face Both Common and Different Considerations

- **Common considerations:**
  - Achieve national objectives
  - Direct ISR capabilities
  - Integrate disparate elements to maximum effect
- **Different considerations:**
  - Resources
  - Operational environments
  - Information needs
  - Time frames





Decision Makers At All Levels Must Direct, Manage, and Exploit Their Information Sources

- **Direct assets to address their critical information needs**
- **Manage assets for best allocation across the force**
- **Exploit information through timely execution**

All Decision Makers Must Instill a Common Understanding Among Subordinates

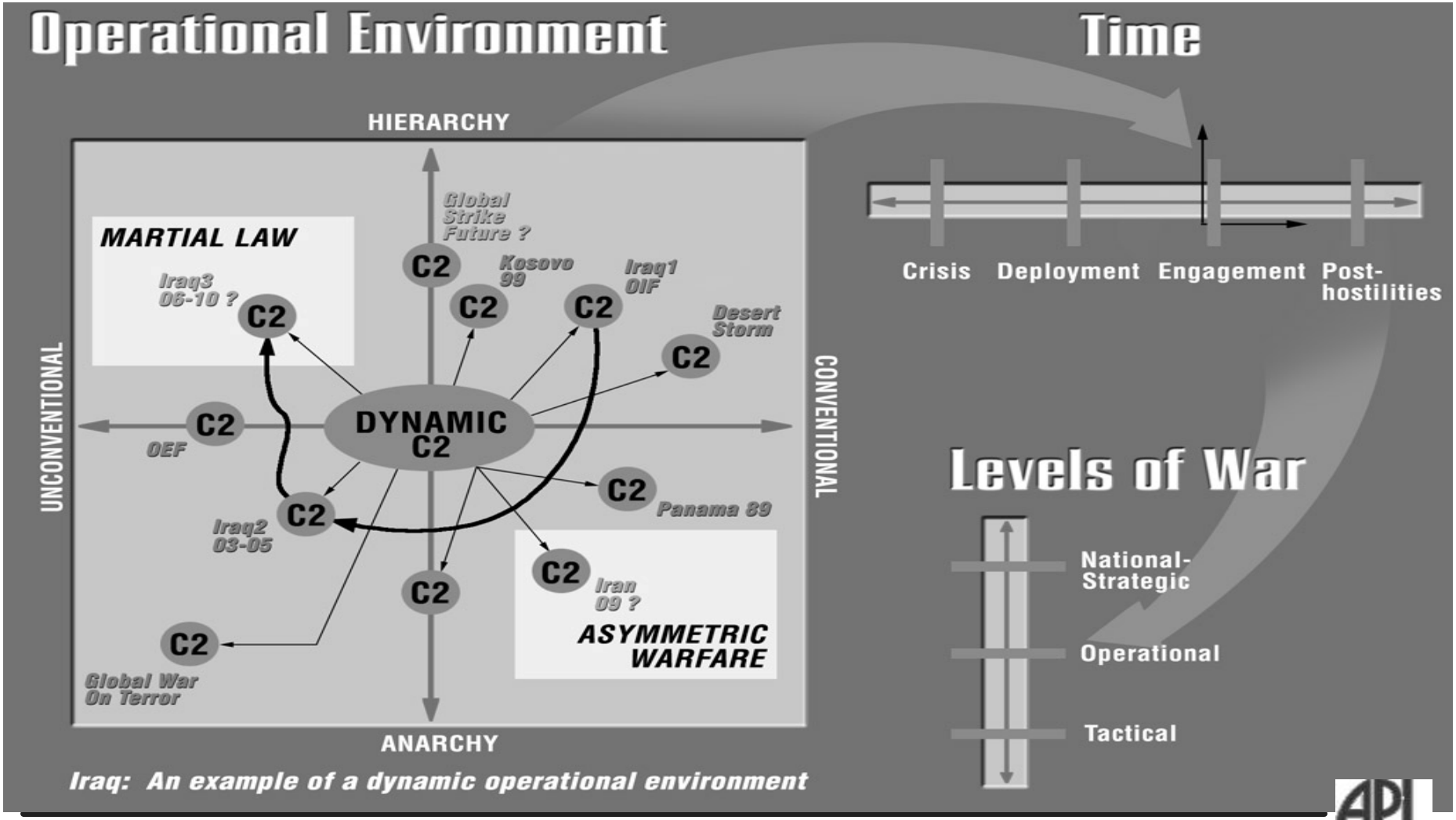
- Mission and objectives
- Operational environment
- Intent
- …appropriate to the level of operations and local conditions

All Decision Makers Must Be Able To Integrate or Collaborate With Other Organizations

- Defense organizations
  - Combatant Commands
  - Services
  - Defense agencies
- Other departments and agencies
  - Departments of State, Treasury, Homeland Security
  - FBI
  - CIA
  - …
- Coalition partners
- United Nations
- Non-governmental Agencies
- Local governments and police
- Religious and political leaders

The Operational Environment is Dynamic; Command Must be Dynamic

- C2 is influenced by the operational environment
- C2 varies over time and levels of war



The C2 Concept

Salient Features

The JHU APL C2 Concept:

- Acknowledges the complexity and diversity of conflicts/crises – the interaction of opposing considerations within unique operational environments
- Contemplates the full spectrum of military activities
  - Presence, peacekeeping, and armed conflict
  - Coalition and interagency operations
  - Homeland defense
- Focuses on conceptual flexibility – the expectation that any operational environment is dynamic and that future C2 must also be dynamic
- Assumes that future C2 must integrate emerging operating concepts with emerging technologies in four key areas:
  - Advanced Situational Awareness/Understanding
  - Decision Making
  - Planning
  - Execution

Situational Awareness: Decision Makers Will Want to Manage It

- Current concepts assume:
  - That a common picture translates into common understanding
  - That common understanding is always a good thing
- Decision Makers will want to manage the picture they develop for their subordinates and superiors
  - For reasons of time and efficiency
  - For reasons of operational security
  - For the purposes of deceiving the enemy
  - For coalition and interagency operations that demand discretion and lower levels of classification
- Depending upon how it is implemented, a "common operating picture" will influence concepts of authority, command, and organizational structure

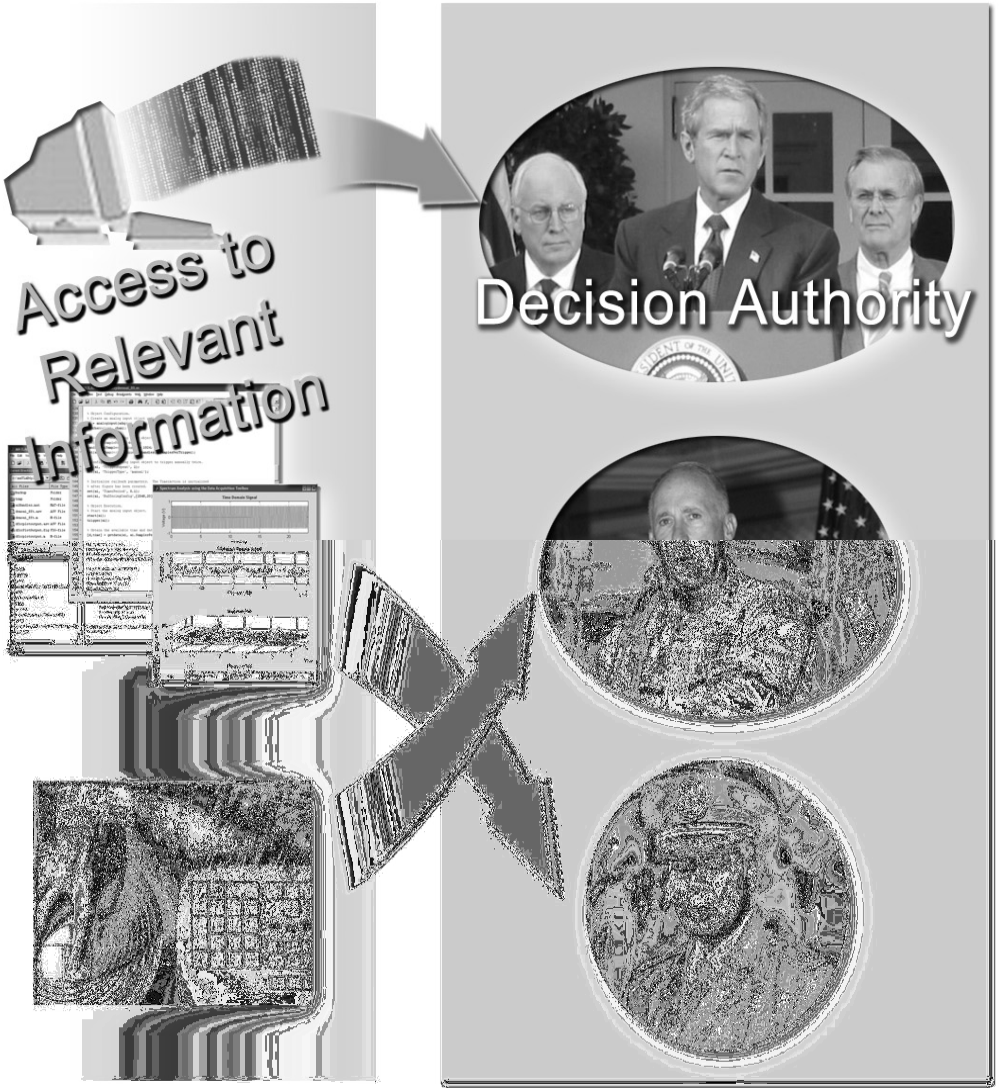
The Concept for Advanced Situational Awareness/Understanding

- Create an on-demand, tailorable operational picture: the state and actions of friendly forces, enemy forces, and their environments
  - Shared awareness of the battlespace
  - Enable users to rapidly develop a clear understanding of the situation in the battlespace
- Leverage information
  - Find, and fuse relevant information
  - Reduce or eliminate poor-quality data
  - Characterize the confidence level of the data portrayed
  - Minimize conflicting information
  - Present the right information to users at the right time
  - Visualize information at multiple security levels
  - Support derivation of situational understanding

The Concept for Advanced Situational Awareness/Understanding (Cont'd)

- Compress into fewer, tailorable displays what is currently provided on multiple devices
  - Adaptable to the specific user's environment (e.g., fighting position, cockpit, headquarters,…)
  - User-selected or tailored formats and media
  - Provide an intuitive means of visualization interaction adaptable to user preferences
- Exploit a cognitive interface between commanders at all echelons

Guiding Principle: Decision Authority Must Match Access to Relevant Information



Matched:

Decision Authority has access to relevant information

Example: Allocating theater air power based on theater-level ISR

Mismatched:

Decision Authority does not have access to relevant information

Example: Allocating close air support without knowing current tactical situation

Example: Late reaction to levy breech in New Orleans

The Concept for Decision Making

- Foster distributed, collaborative decision making across echelons, services, agencies and coalitions
- Adapt to individual decision-making styles ("stylized" decision aids)
  - Utilize a profile of the user's behavior and cognitive process, based on their demonstrated information requirements, as well as their specification of criteria and preferences to facilitate the development, selection, and presentation of options
  - Support diverse user environments and operating conditions

The Concept for Decision Making (Cont'd)

- Provide a very rapid means for conducting the assessment component of the decision-making process, a process that includes a comparison of the current situation to the expected state and the projected state of both friendly and enemy forces iteratively throughout planning and execution
  - Conduct comparative analytic tasks that reveal variances in the execution of the plan, facilitate rapid and effective decision making, and enable the synchronization of forces necessary to support selected options
  - Based on an understanding of the current, expected, and projected states, develop and portray options that will either overcome the current and projected challenges or enable the force to exploit emerging opportunities
  - Support an autonomous or collaborative evaluation of these options

Planning and Execution: Decision Makers Must Be Both Reactive and Proactive

Proactive

- Used against an easily anticipated enemy
- Normally requires information superiority
- The preferred way to fight in the American military—but not always possible

Reactive

- Used against an enemy that defies templating
- A sound approach when information is scarce
- Often the precursor to or successor to proactive measures

DECIDE - DETECT - DELIVER

DETECT - DECIDE - DELIVER

A dynamic Command Concept must not default to one or the other…but facilitate <u>both</u>

The Concept for Planning

- Define Command relationships dynamically, based on changing circumstances: who is supported, who is supporting, …
- Reduce dependencies on manual processes to acquire, process, and quantify information; freeing decision makers to focus on the implications of that information
- Analyze and predict the consequences of courses of action
  - Rapid means to quantify potential outcomes
  - Perform sensitivity analysis
- Reduce manpower requirements for routine bookkeeping tasks

The Concept for Execution

- Enable the regulation of forces and operating systems
  - Exploit functionality common to entities (maintain situational awareness, receipt of instructions, formulation of instructions, dispatch of instructions, etc.)
  - Preserve functionality unique to particular entities (targeting, maneuver, sensor management, bandwidth allocation, asset visibility, law enforcement,…)
- Foster dynamic communities of interest
- Incorporate both the control of sensors and the integration of sensor output as part of C2 capability
- Anticipate and adapt to changing conditions
  - Forecast and report changes in friendly, enemy, or environmental conditions
  - Identify variances in performance from the Commander's concept of operation
- Degrade gracefully (maintain essential functionality)

Summary: Empower Decision Makers

Future C2 systems must support the ability to:

- **Gain and maintain Situational Awareness/Understanding**
- **Enable decision making in diverse operational environments**
- **Enable distributed, collaborative decision making across echelons, services, agencies and coalitions**
- **Define relationships dynamically, based on changing circumstances**
- **Regulate the elements of the force, both military and non-military**
- **Support the interaction of dynamic communities of interest**

Multi-Mode Precision Strike Weapons

Agenda

- **The Need for Multi-Mode Guided Weapons**
  - **Definitions – what do we mean by multi-mode?**
  - **60+ years of increasing precision – but we're not there yet**
- **Identifying the Gaps in Capability**
  - **Target Set Coverage**
  - **Targeting infrastructure performance**
  - **Precision engagement of movers in weather, clutter & ROE – the Holy Grail**
- **Filling the Precision Strike Gap**
  - **Precision Self & 3rd Party targeting**
  - **Multi-mode seekers**
  - **Weapon Data Links**
- **Implications and Issues**
  - **What technology, with the right TTP, might provide solutions?**

Single & Multi-Mode Precision Weapons

- **Single Mode**
  - **Semi-active Laser**
    - **GBU-12/16/24, etc.**
  - **GPS/INS (CSW)**
    - **GBU-31/32 JDAM**

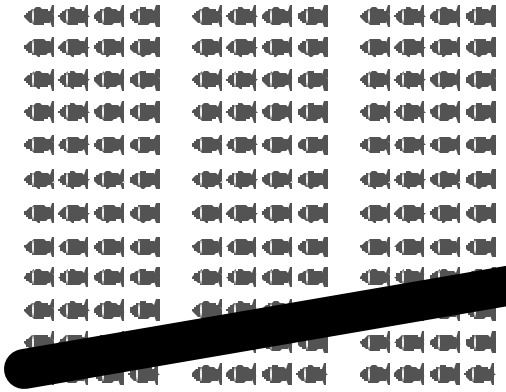
- **Multi-Mode**
  - **Semi-active Laser + GPS/INS**
    - **Enhanced Paveway II/IV**
    - **Laser JDAM**
  - **IR terminal seeker + GPS/INS**
    - **JSOW Unitary**
  - **DSMAC+GPS/INS+Datalink**
    - **Tactical Tomahawk**

Air Armament: A Capability Transformation Success Story

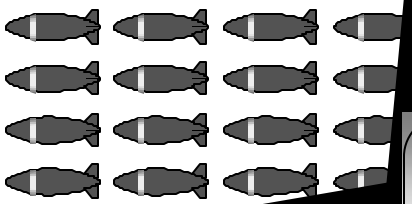
Dispersion:

~100 mils	~20 mils	~0.6 mils	0 mils
1943	**1970**	**1991**	**1999**

1500 B-17 sorties
9000 bombs (250#)
3300 ft CEP
One 60' x 100' target
W.W.II



30 F-4 sorties
176 bombs (500#)
400 ft CEP
One Target
Vietnam



1 F-117 sortie
2 bombs (2000#)
10 ft CEP
Two Targets per Sortie
Desert Storm

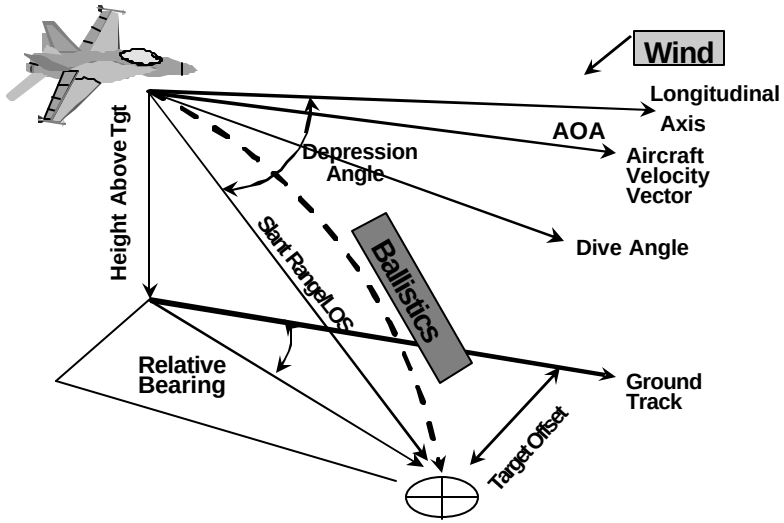
1 B-2 sortie
16 bombs (2000#)
20 ft CEP
16 Targets per Pass
All Weather

Revolutionary Technologies

Laser Guidance

GPS Guidance

Dispersion in Aerial Gravity Bombing



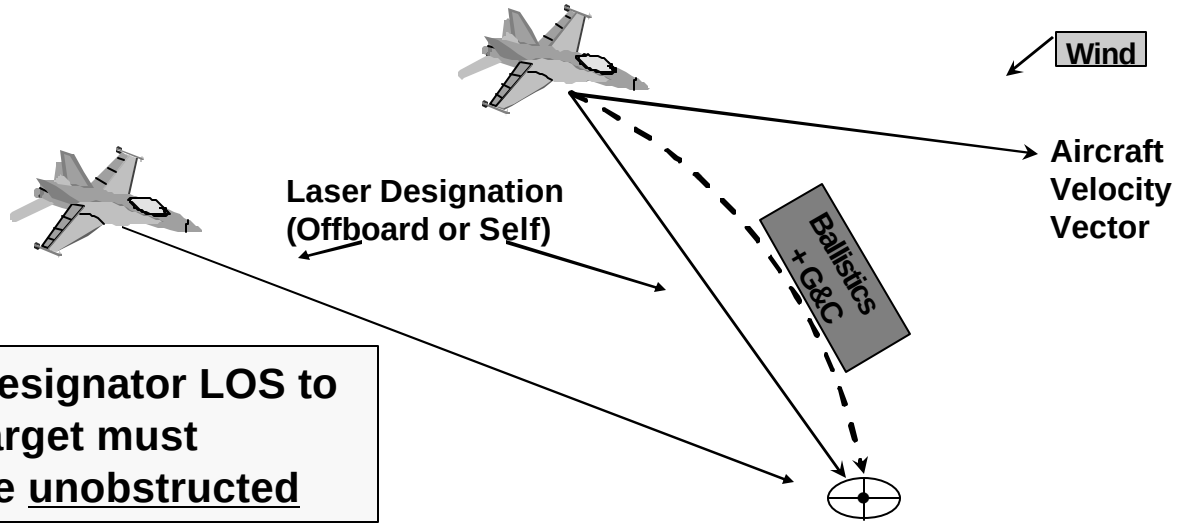
Goal:
Release when ballistic path intercepts target

Typical Bombing System Error Sources for "Dumb" Bomb Delivery

- **Wind error**
  - Pre release
    - INS Velocity error
    - TAS errors
  - Post release
    - Shear
    - Atmospheric model vs. actual conditions
- **Dispersion error**
  - Ballistic table errors
  - Weapon manufacturing variability
  - Ejector rack timing/velocity
- **Angle, range or velocity measurement error**
  - Boresight error
  - Incorrect aimpoint by crew
  - G or sideslip
  - INS velocity, TAS or Altitude error
  - Range sensor errors & limitations
    - Beam width, graze angle, FOR, resolution, pointing, etc

Typical automated freefall bomb system dispersion today is ~ 6 mils

Dispersion in Laser-Guided Bombing



If release occurs within kinematic envelope and LGB kit functions, kit corrects for wind and dispersion

Designator LOS to target must be unobstructed

- **Wind error**
  - Pre release
    - INS Velocity error
    - TAS errors
  - Post release
    - atmospheric model vs. actual conditions

- **Dispersion error**
  - Ballistic table errors
  - Weapon manufacturing variability
  - Ejector rack timing/velocity

- **Angle, range or velocity measurement error, designation error**
  - Boresight error
  - Incorrect aimpoint designation by crew
  - INS velocity, TAS or Altitude error (out of kinematic envelope)
  - Range sensor errors & limitations
    - Beam width/dispersion, graze angle, FOR, resolution, pointing, stabilization, etc

Typical automated LGB system dispersion is ~ 0.6 mils

- ~1 Order of magnitude improvement in effectiveness for cost of FLIR + LGB kit

Dispersion in GPS Guided Weapons (CSWs)

- **CEPs for GPS/INS guided weapons are a function of targeting accuracy, current local GPS performance, and weapon kit guidance & control performance:**

Generally, CSW CEP = $\sqrt{(TLE)^2 + (GPS)^2 + (G\&C)^2}$

Difference between target's actual location and provided coordinates

(Preplanned JDAM spec ≤7.2m CEP_{TLE} for 13m weapon CEP)

GPS accuracy at the time/place of the attack

Ability of weapon to hold the commanded flight path

- **GPS weapons are designed to guide to a coordinate location**
  - ✍ **They do not "detect" or "track" a target in the conventional sense, so ultimately, the weapons *must have* target coordinates**
  - ✍ **Same in future with Galileo or other positioning systems**
- **But the advantages are: all weather capability, and no dispersion (Fixed-target CEP is essentially the same regardless of range)**

Strike Planning Begins with Target Set Analysis

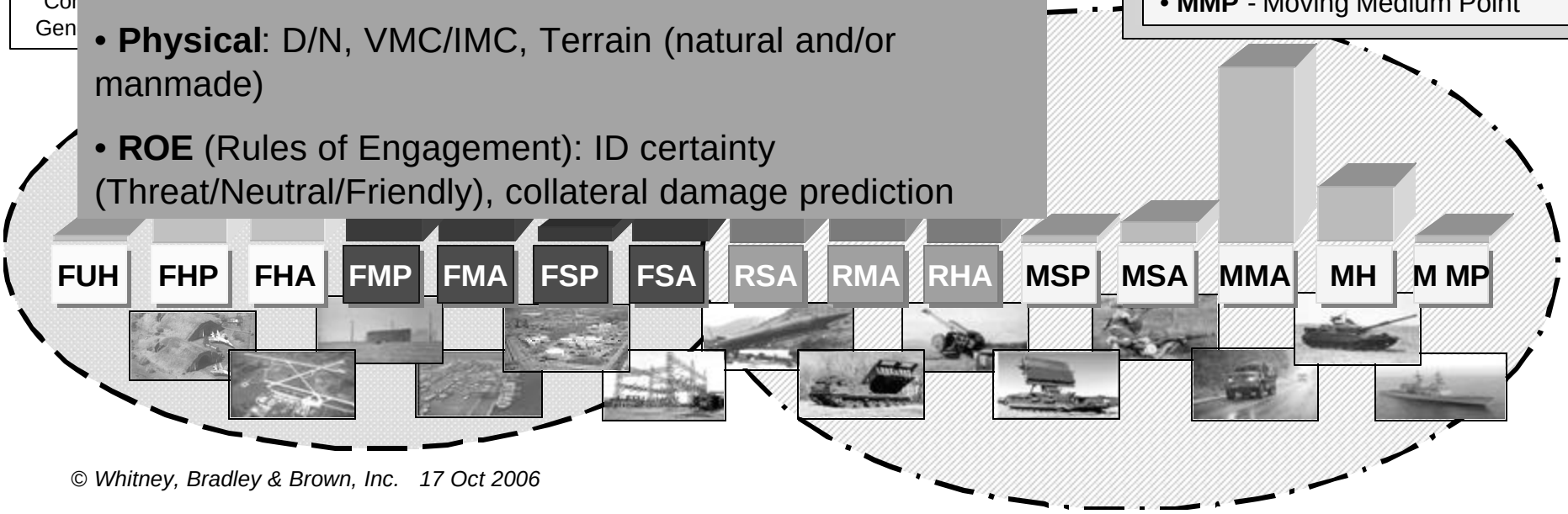
- **Binning targets as a function of their characteristics**

Mobility	**Hardness**	**Size**
Fixed	Hard	Point
Relocatable	Medium	Area
Moving	Soft	

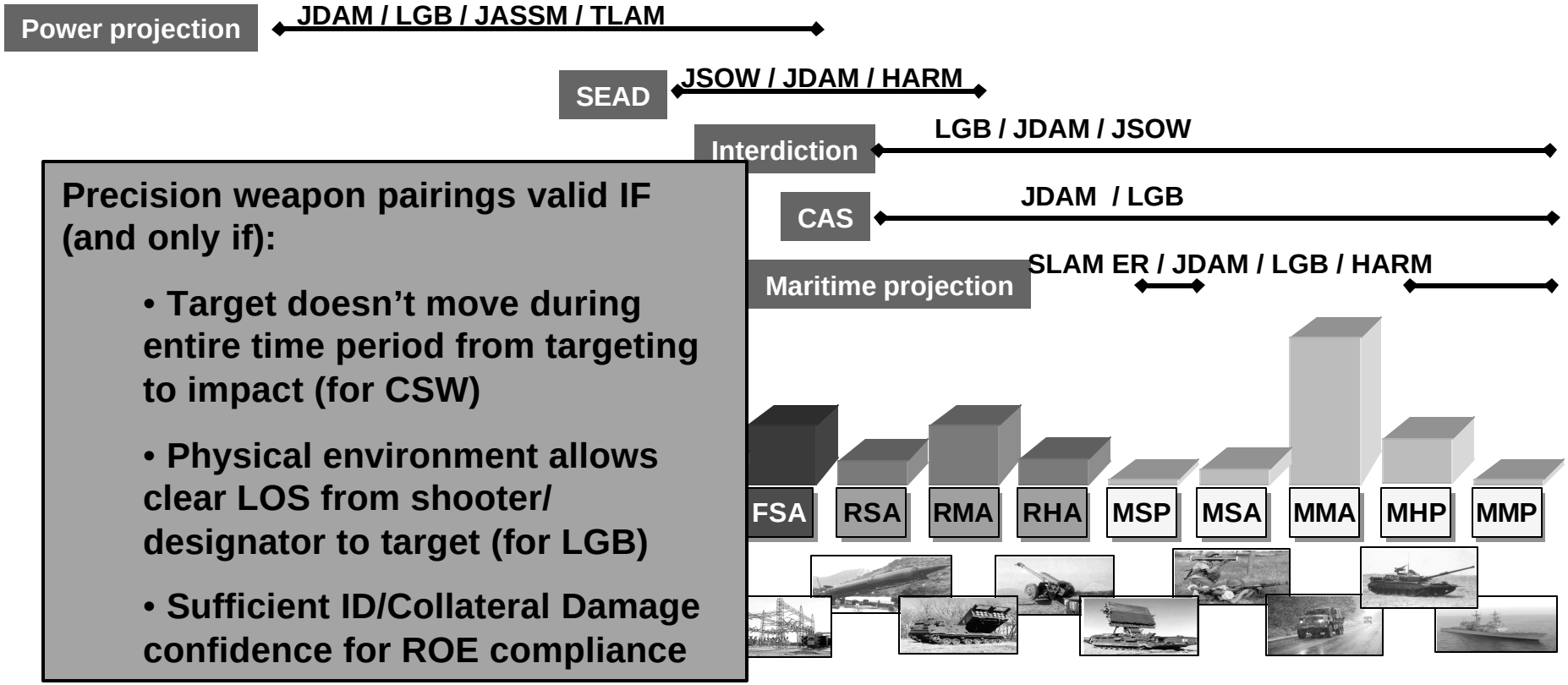
- **But the planner must ultimately consider the mission environment**
- **Threat:** Survivability of delivery platform, designator and weapon
- **Physical**: D/N, VMC/IMC, Terrain (natural and/or manmade)
- **ROE** (Rules of Engagement): ID certainty (Threat/Neutral/Friendly), collateral damage prediction

19 Target Classes

- **FUH** - Fixed Ultra Hard
- **FHP** - Fixed Hard Point
- **FHA** - Fixed Hard Area
- **FMP** - Fixed Medium Point
- **FMA** - Fixed Medium Area
- **FSP** - Fixed Soft Point
- **FSA** - Fixed Soft Area
- **RSA** - Reloc. Soft Area
- **RMA** - Reloc. Medium Area
- **RHA** - Reloc. Hard Area
- **MSP** - Moving Soft Point
- **MSA** - Moving Soft Area
- **MMA** - Moving Medium Area
- **MHP** - Moving Hard Point
- **MMP** - Moving Medium Point



Target, Weapon, & Mission Pairings Follow



Precision weapon pairings valid IF (and only if):

- **Target doesn't move during entire time period from targeting to impact (for CSW)**
- **Physical environment allows clear LOS from shooter/ designator to target (for LGB)**
- **Sufficient ID/Collateral Damage confidence for ROE compliance**

Precision munitions currently cover the entire fixed target set, but can engage movers only with favorable target behavior and mission conditions

The Real Mission Environment:
Weather in Operation Iraqi Freedom (OIF)

- **70% cloud free only 30% of time**

- **17 of 31 days good weather (clear to scattered clouds <10K ft)**

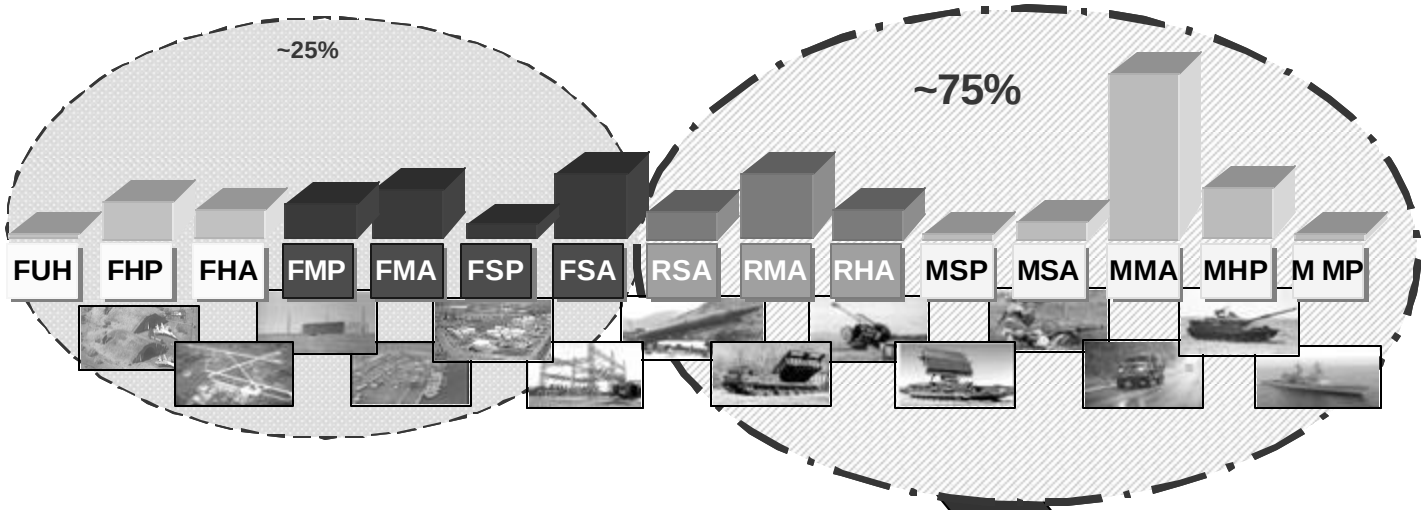
Ref: CENTAF "OIF By the Numbers", 30Apr03

Currently Deployed Multimode Weapons Primarily Improve Engagement of Stationary Targets

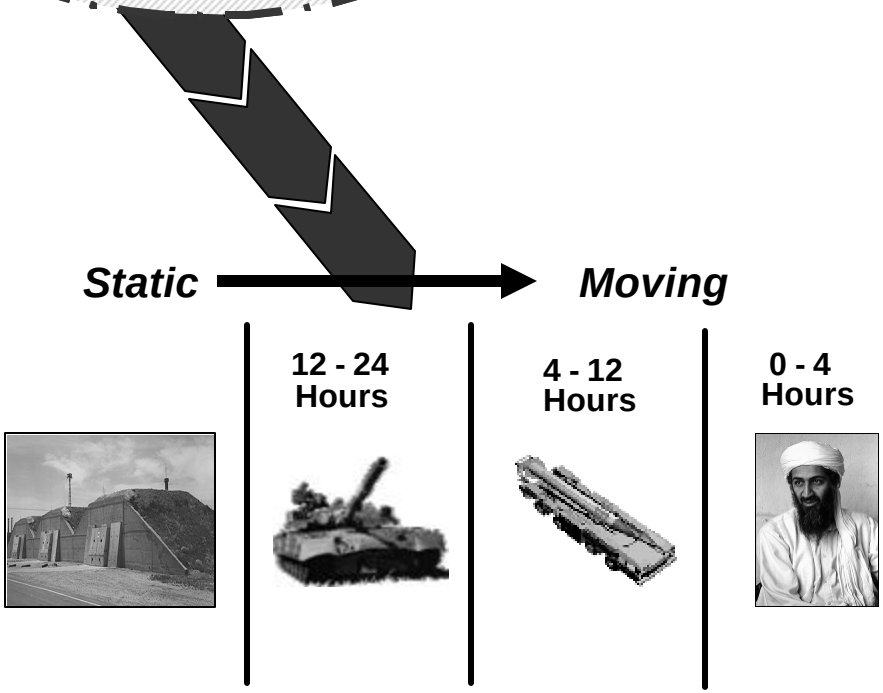
- **Requirements derived from current mission environment**
  - ✍ **Frequent bad weather, many targets of opportunity**
- **In Operation Enduring Freedom/Afghanistan:**
  - ✍ **U.S. aircraft carried mixed LGB/JDAM loads**
  - ✍ **In clear weather used FLIR to self- target and designate LGBs**
  - ✍ **In IMC used ground controllers to supply target ID & coordinates**
- **Could run into one or both conditions on a single mission**
  - ✍ **If one, only half the bomb loadout was usable**
- **Created US requirement for Enhanced Paveway II/Laser JDAM multimode (Laser+GPS/INS)**
  - ✍ **Already in UK service**

The UK has been well ahead of the US in both recognizing this multimode requirement and procuring a solution

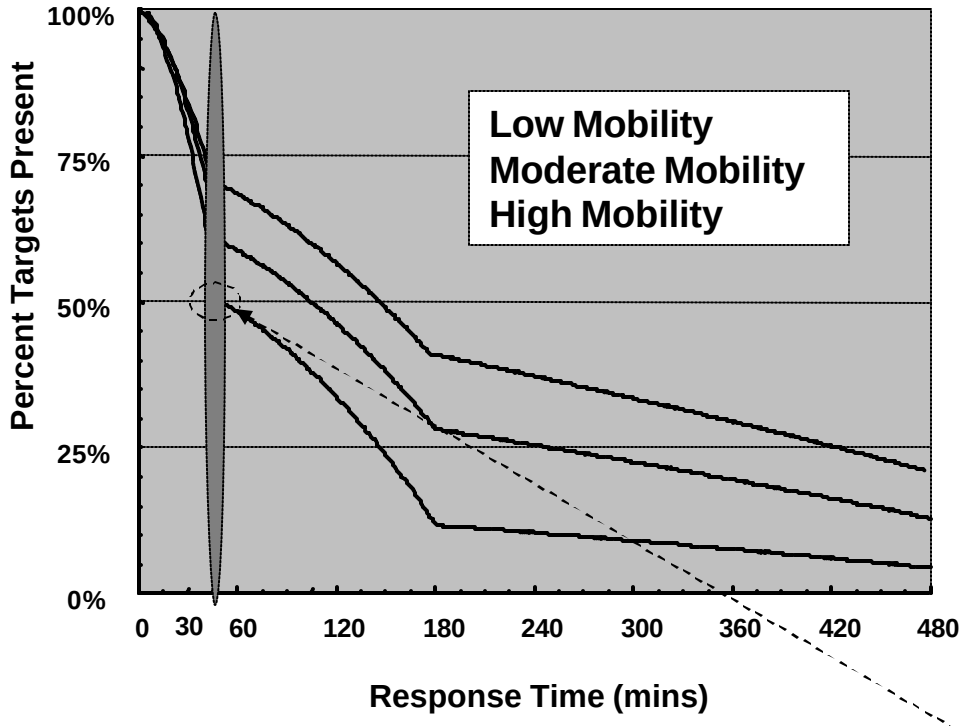
The Challenge of Mobile Targets



Thus far, precision engagement has not overcome the basic problem of target mobility, particularly when exacerbated by adverse mission conditions (bad weather, clutter, restrictive ROE)



Implications of Target Dwell Time



- US Army study for the ATACMS AoA classified mobility of moving targets by three characteristics
  - High - Moderate - Low mobility
- Study analyzed the response time necessary to put weapons on a target given an assumption as to its degree of mobility
  - Study assumed stable speed and direction of target movement
- 50% of high mobility target set has an expected dwell time of < 45 minutes

Current targeting infrastructure and methodologies are not responsive enough for short-dwell targets (let alone movers)

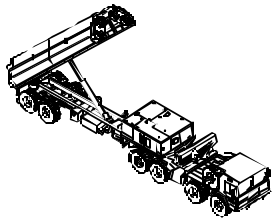
Key Capability Gaps:
What Must be Addressed to Reach "The Grail"?

- **Stationary targets:**
  - **Imagery mensuration or intel-based precision targeting:**
    - **Is too slow, not portable/fieldable, requires connectivity from controller/delivery platform to limited number of centers**
    - **Requires highly-trained targeteers with expensive equipment**
  - **Real-time coordinate generation in the field:**
    - **Is too imprecise at operationally useful ranges**
    - **Uses equipment that is expensive, heavy or both**
    - **Through-the-weather sensors lack sufficient resolution for positive ID, especially in clutter**
- **Moving targets:**
  - **Historical solutions (area/cluster weapons, stopping motion by striking choke points), cannot meet the high ROE standards we have set with fixed-target precision strike**
  - **Real-time precision tracking has same problems as with stationary targets, but more acute**
  - **Laser designation may require excessive exposure**
  - **Must be able to do many-v-many**

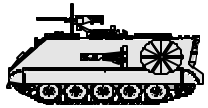
What Sensor Resolution is Required?

Discrimination Requirements for Mobile / Relocatable Targets

Tank
T 80: 24 x 11 x 5



SAM TEL
SA-10: 41 x 10 x 12



APC
BMP 3: 22 x 11 x 8

Critical airborne dimension

*** Required number of pixels on target "critical dimension" for a particular level of discrimination**

Confidence factor

Detect

- Contact
- Clutter

Classify

	80%	90% *
IR	1.5	2
Radar	3	4

- Tracked
- Wheeled

Recognize

- Tank
- APC
- ADU

Identify

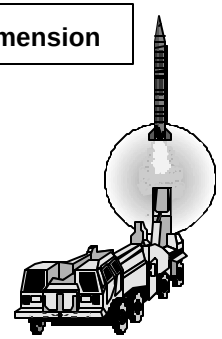
	80%	90% *
IR	12	16
Radar	24	32

- T80
- M1A1

IFFN

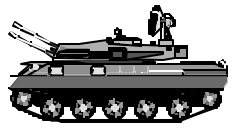
- Enemy
- Ally

Extracted from text on Johnson Criteria and Army field targeting



TBM TEL
SCUD: 44 x 12 x 10

Truck
ZIL 24 x 9 x 9

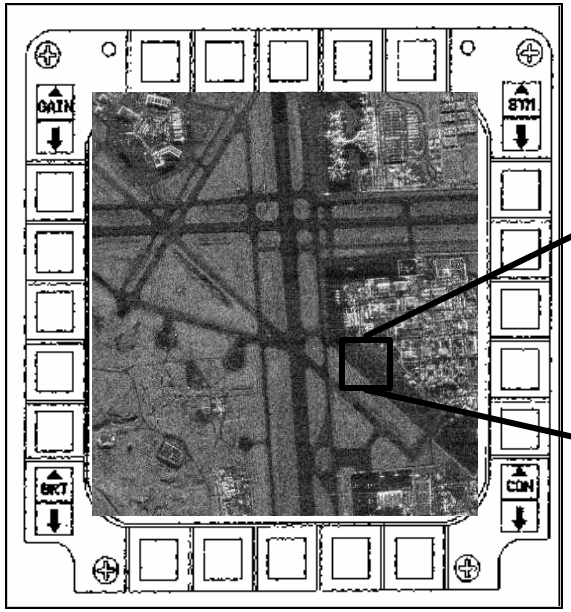


Artillery/AAA
ZSU 23/24: 21 x 10 x 7

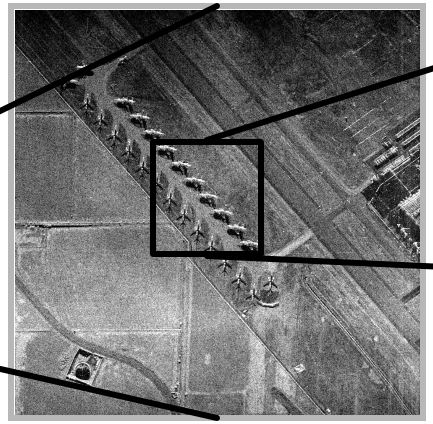
ID requirements generally exceed performance of currently fielded systems

Dimensions in "feet"

SAR Displays vs. Resolution

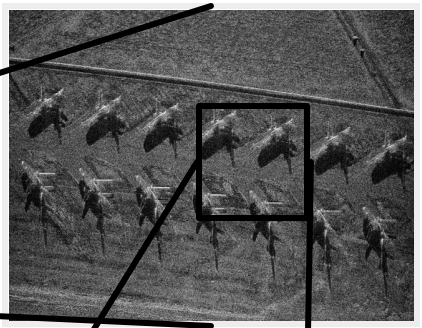


2.5 Foot Strip

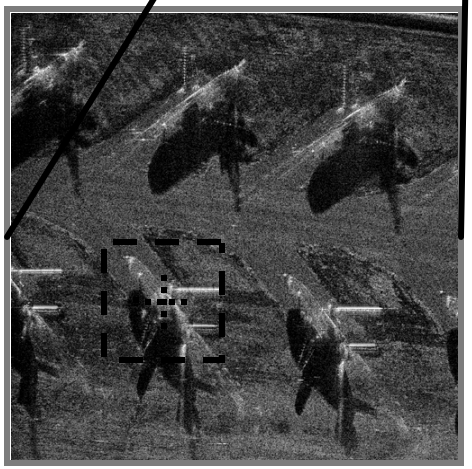


Find

1 Foot Spotlight



Localize

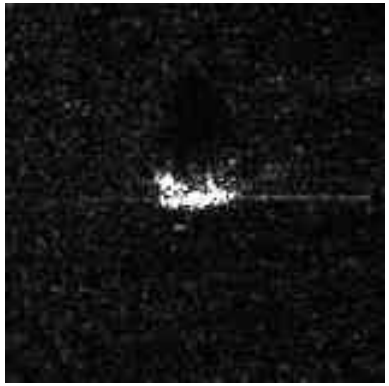


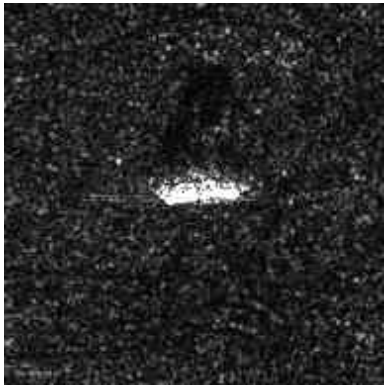
ID / Target

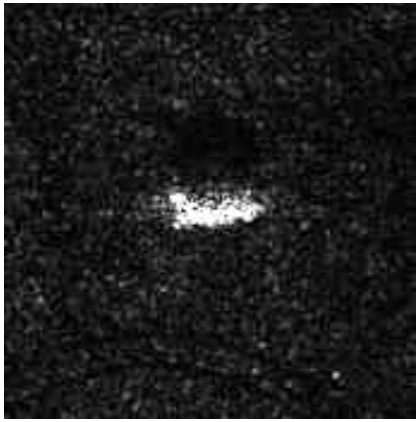
6 Inch Spotlight

Even with high resolution, SAR requires precision velocity reference to achieve precise TLEs, and targets must be stationary

What Is It? Is It the Same Object?







ZSU-23/4

Zil-131

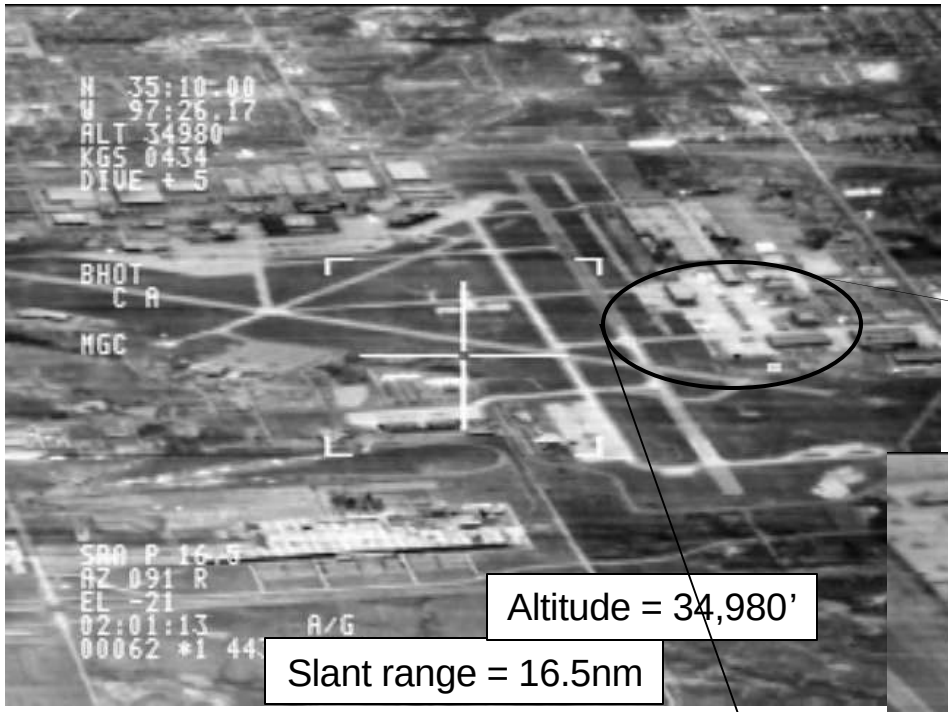
T-62

MSTAR Data Collection
By Sandia Nat'l Laboratory

- **1 foot SAR**
- **X-Band**
- **15 depression angle**
- **Spotlight mode**

FLIR Image – Resolution Example

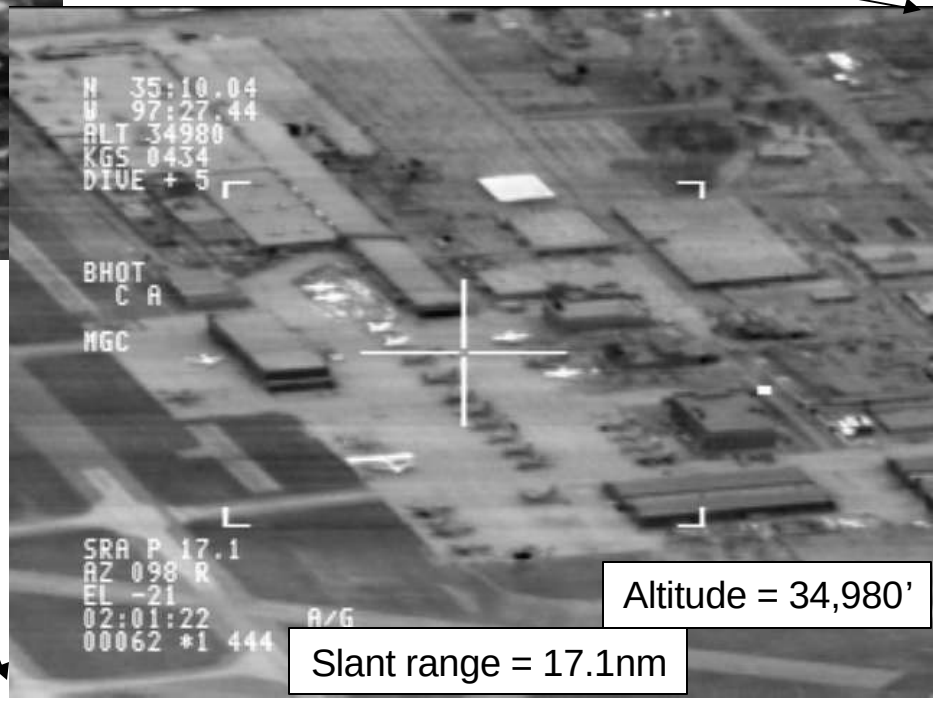
Wide Field of View



Altitude = 34,980’

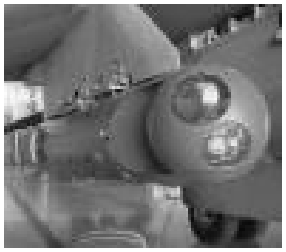
Slant range = 16.5nm

Narrow Field of View



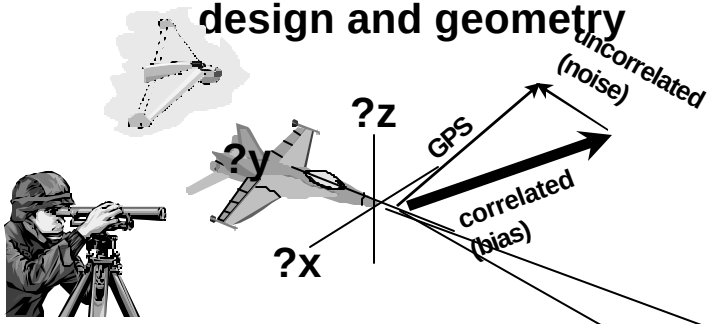
Altitude = 34,980’

Slant range = 17.1nm



Relative or Self Target Coordinate Generation

- **Targeting occurs in local GPS coordinate reference, relative to sensor position or another ground point (OAP or offset aimpoint)**
  - **Relative TLE will include both measurement error and current GPS error – results require mensuration to obtain absolute WGS84**
  - **Relative measurement error (RME) is difference between actual and measured position relative to targeting platform, and includes errors due to sensor type, design and geometry**

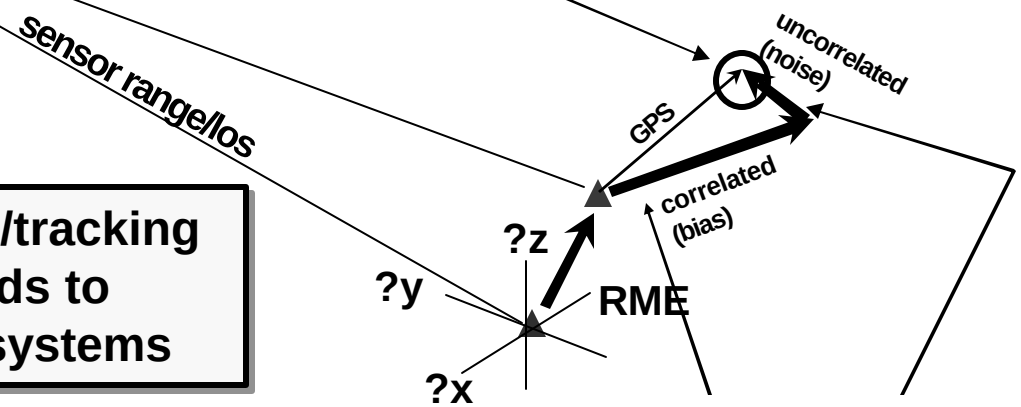


$$TLE = \sqrt{(RME)^2 + (GPS)^2}$$

Target GPS coordinates (x,y,z)

- **Calculated by adding sensor-to-target ?x, ?y, ?z to current GPS position**

RME has many error components & limitations that vary with range, geometry and sensor design and performance

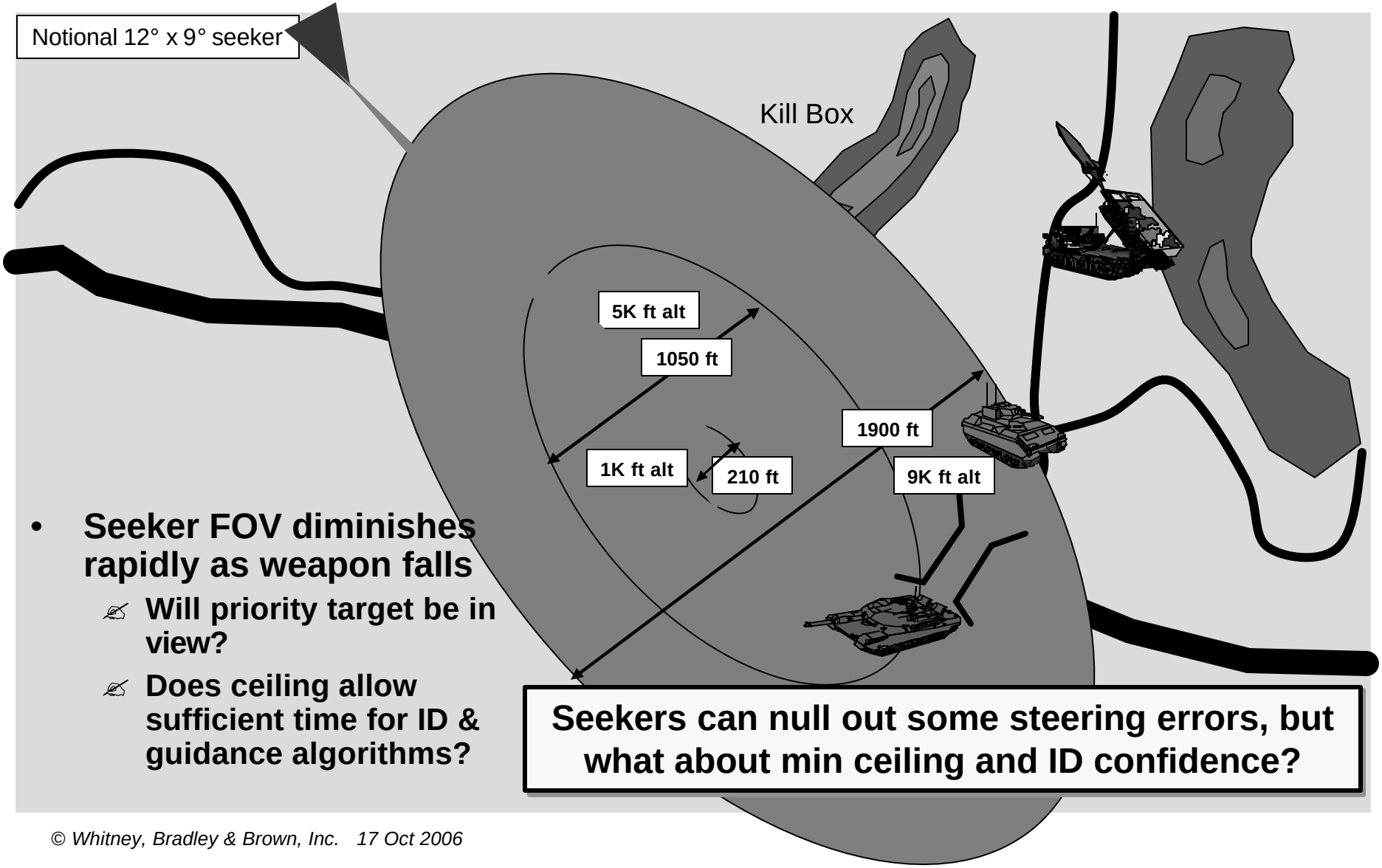


Adding precision location/tracking to ID requirements adds to complexity of targeting systems

Solving the Target Motion Problem in a Difficult Mission Environment

- **Analogous to air-to-air engagement in slower motion, except:**
  - ✍ **Shooter & weapon cannot maneuver below target**
  - ✍ **Huge increase in clutter**
- **Leads to two basic approaches:**
  - ✍ **Continuously track target, provide position updates to weapon at suitable rate using one or more data links (like tail control AAM)**
    - **Can be done with one or more onboard or off-board sensors**
      - **AMSTE program (Affordable Moving Surface Target Engagement) has demonstrated a direct hit on 30+ MPH truck using both JSOW and JDAM, using JSTARS & TACAIR or UAV tracking**
      - **Future networks could also enable ground tracking (e.g. UAV coupled with a weapon data link)**
  - ✍ **Add terminal seeker to weapon, use GPS to navigate into seeker acquisition box (like AMRAAM or Advanced Paveway)**
    - **Proposed by Joint Common Missile, probable for SDB Phase II**
    - **Positive ID in clutter <u>still a problem</u> if no MITL datalink is used**

Notional Seeker – Are Seekers the Answer?



- **Seeker FOV diminishes rapidly as weapon falls**
  - **Will priority target be in view?**
  - **Does ceiling allow sufficient time for ID & guidance algorithms?**

Seekers can null out some steering errors, but what about min ceiling and ID confidence?

Resolution vs. ID Confidence
Complicated by a Clever Enemy

- **Operation Allied Force**
- **"At night, when these groups heard a Predator or AC-130 coming, they pulled a blanket over themselves to disappear from the night-vision screen. They used low-tech to beat high-tech."**

  - **>50% Cloud Cover >70% of the Time**
    - **Unimpeded Airstrikes Only 24 of 78 Days**
  - **Extensive Enemy Use of Deception Techniques and Concealment**

If a human observer at close range is uncertain about ID, how well can a remote sensor or seeker perform?

Interim Solutions:
Litening Pod Downlink & ROVER

- **Sensor downlink from Harrier and Hornet**
  - **Developed by US Marine Corps for offensive air support missions (CAS, ground aided strike)**
  - **Supplies GCE video feed of aircraft targeting sensor or UAV**

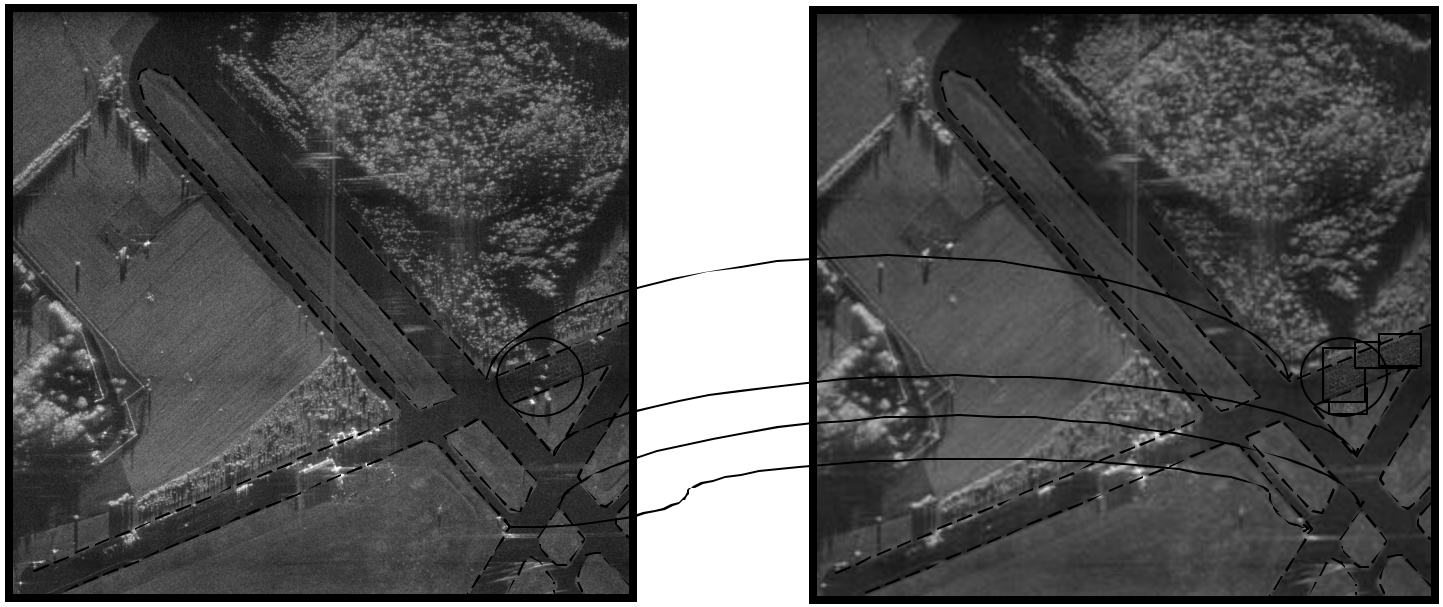
Litening Pod Video Downlink Capability

- **USMC downlink Litening Pods in OIF**
  - ✍ **5 Pioneer/9 Predator Pods**
- **43 Rover stations in theater**
  - ✍ **Other organic receive stations (MRS, RRS,GCS)**
  - ✍ **Access to UAV feeds**
- **New ways to employ**
  - ✍ **Convoy Escort / ISR (1000+) combat missions**
- **Benefits**
  - ✍ **Rapid & positive target ID**
  - ✍ **Increased GCE SA (Situational Awareness)**
  - ✍ **Very effective against stationary targets**

Actual ground display

In-flight or Field Registration of Tactical Imagery

- Registration software ID's common features in two images
- Tactical image "controlled" to reference via edge/feature matching
- Algorithm identifies and links image "tie points"

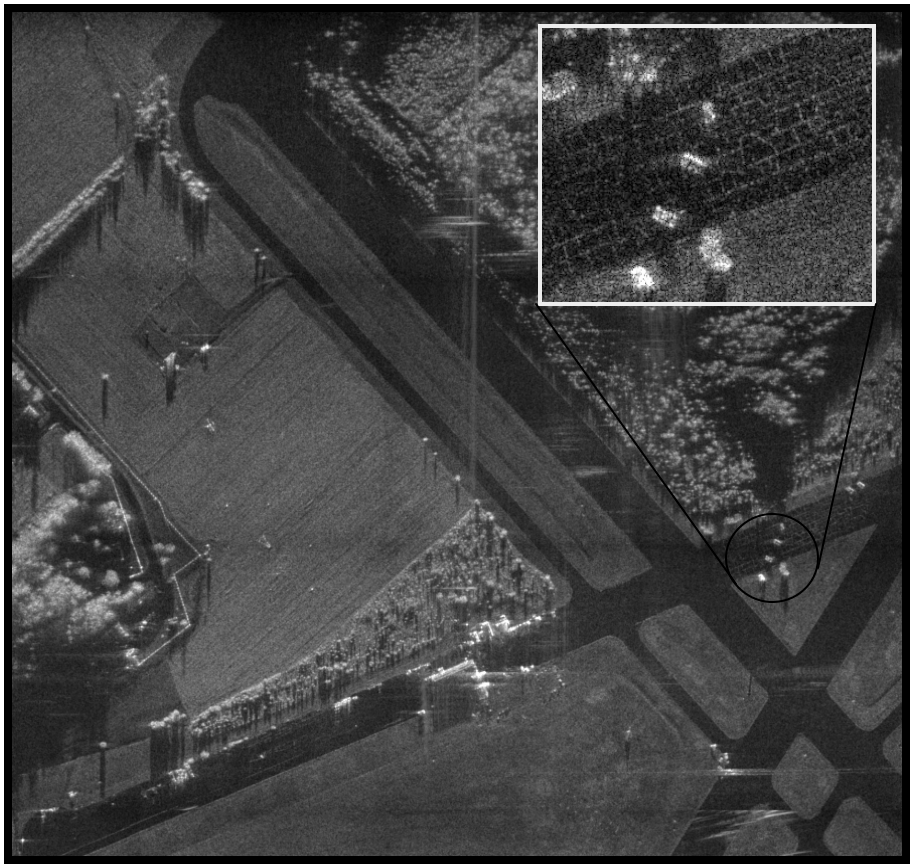


Tactical Image

Reference Database Image

Precise geo-coordinates of any tactical imagery feature available once controlled to reference image

Current Application:
Precision Strike Suite for Special Operations Forces (PSS-SOF)

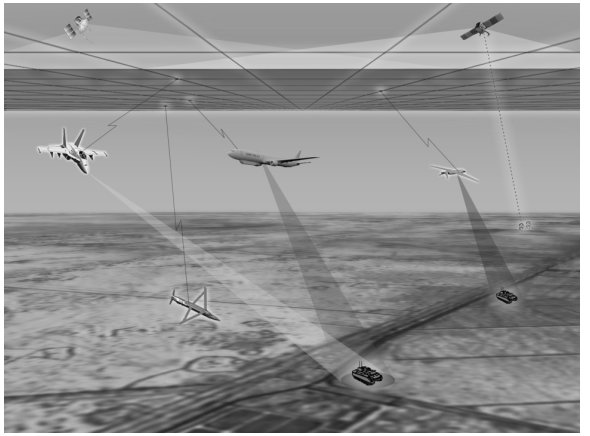


Auto Mensuration of Tactical Image
- ~10 minutes
- Targets present/observable
- ~10 meter TLE for field forces

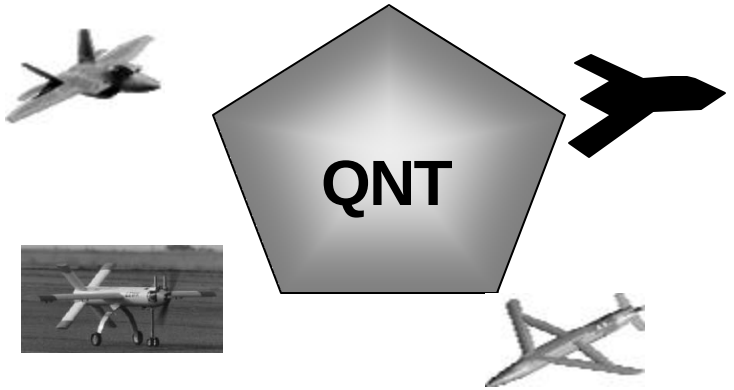
Reference Database on Laptop
- Targets not present
- Created/uploaded prior to deployment
- Precisely geo-referenced

What About the Future?
Building a Networked System of Systems

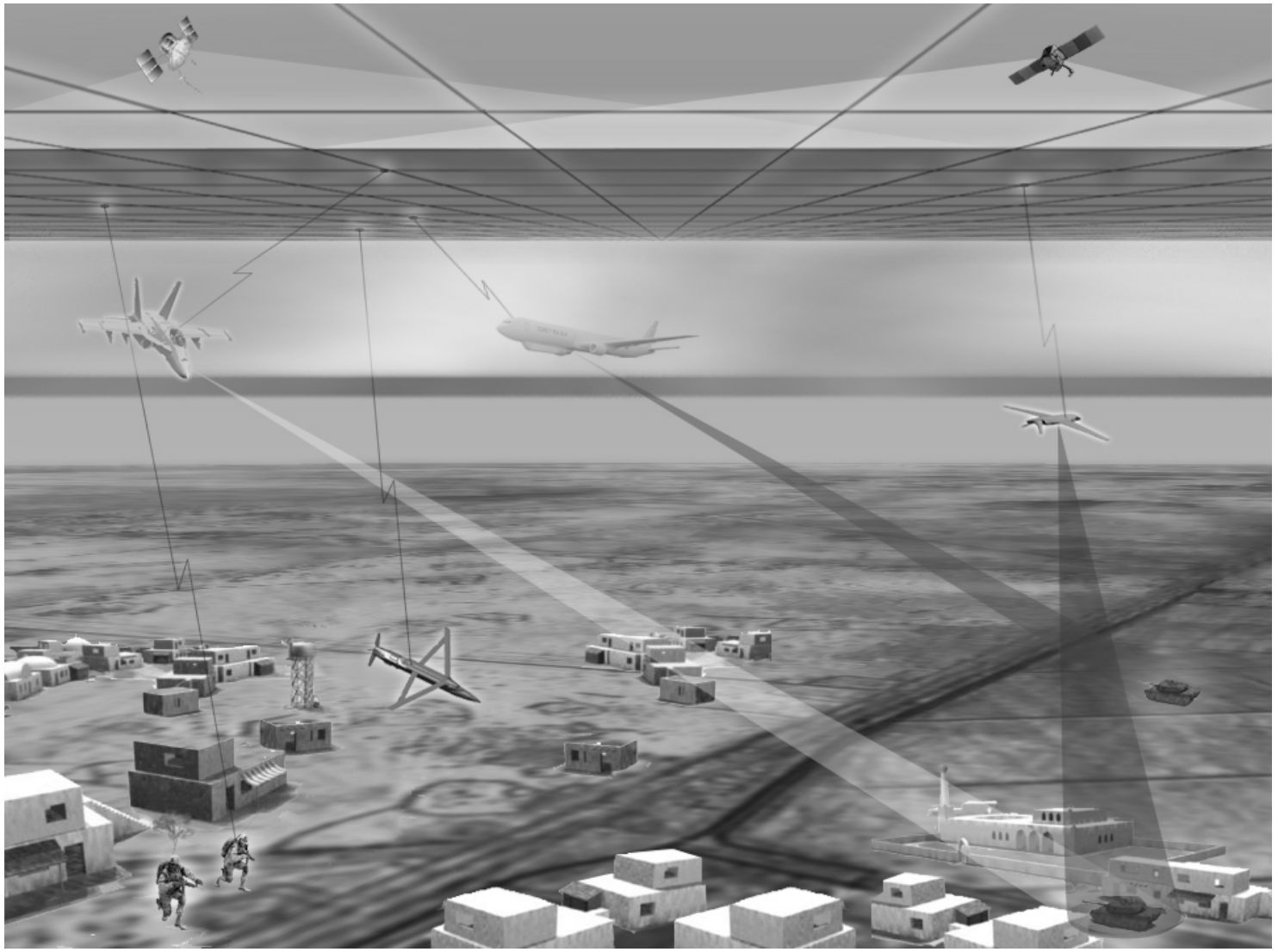
- **Joint AF/Navy Weapons Data Link Network ACTD – Desired capabilities:**
  - **Weapon In-Flight Target Update**
  - **Weapon Retargeting**
  - **Weapon In-Flight Tracking**
  - **Weapon Bomb Impact Assessment (BIA)**
  - **Weapon Abort**



- **DARPA Quint Network Technology ACTD – Hardware and architecture to link:**
  - **Tactical Aircraft**
  - **Dismounted ground forces**
  - **Small UAVs**
  - **Armed UAVs**
  - **Precision weapons**



How Achieving “The Grail” Could Look



Conclusions

- **In the end, MultiMode weapons are only part of the answer for moving and relocatable targets**
- **Must be able to target & track movers precisely, ID confidently, with acceptable Collateral Damage, through the weather, in cluttered environments, with many v. many engagements at once**
- **Over & above the weapons, this will require:**
  - **Persistent observation at high resolution**
  - **Precise track generation**
  - **A common network between ground observers, targeting and delivery platforms, and weapons**
- **We have some distance to go**
  - **But programs such as the DARPA Quint Networking Technology (QNT) ACTD could be a fair start**

Strike Planning Enterprise Service Oriented Architecture

Precision Strike Technology Symposium
October 19, 2006

Mr. George Mayer
Deputy Program Manager
Email: george.f.mayer@navy.mil
(301) 757-8019

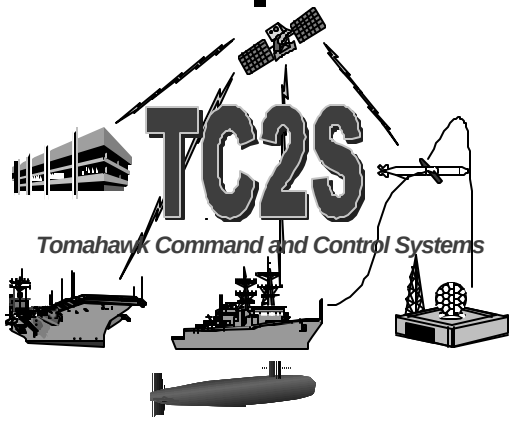
NAVAIR

CVN-70/77
CVN-21

JMPS Expeditionary

TPS
MDS/TCOMMS

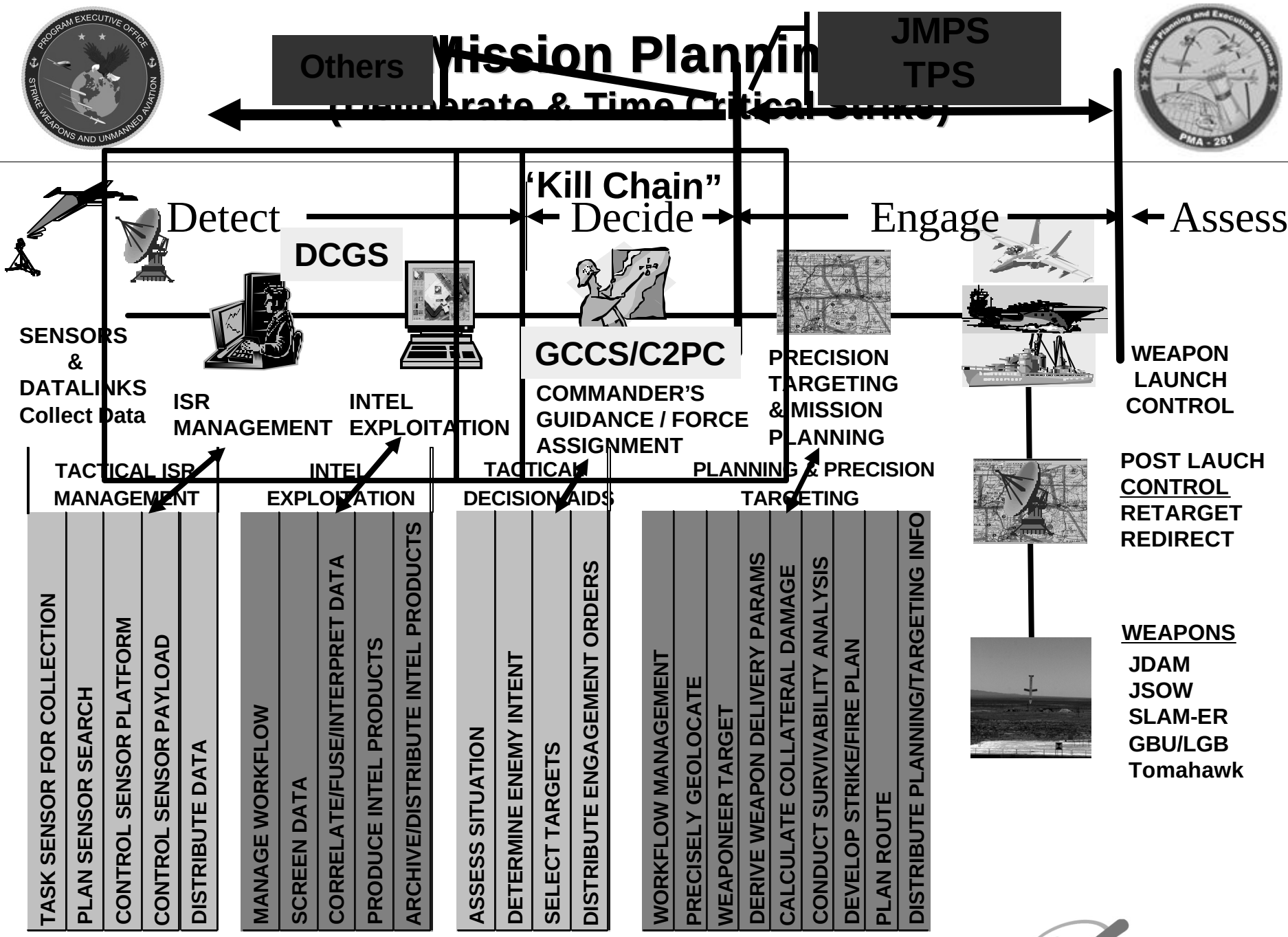
F/W
C/C
UPC



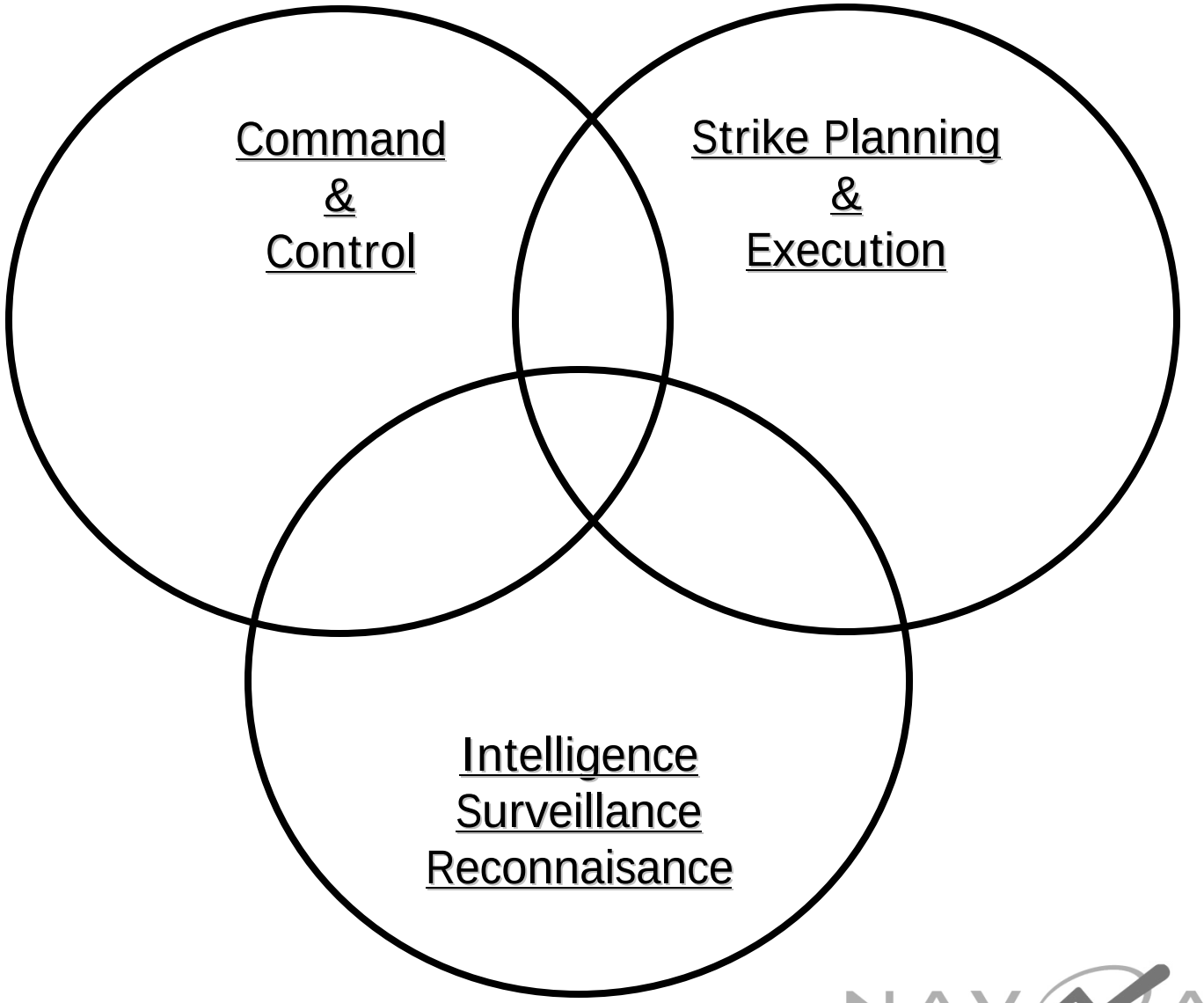
PMA281 Strategic Vision:
Be the Naval Center of Excellence for Mission (Strike) Planning and Execution

Sponsors:
N6F, N85, N86, N87, N88, N2, N89, N091C

DASNs:
DASN(IWS), DASN(AIR), DASN(MLW)


Others
Mission Planning
(Deliberate & Time Critical Strike)
JMPS
TPS
"Kill Chain"
Detect
Decide
Engage
Assess
DCGS
SENSORS & DATALINKS Collect Data
ISR MANAGEMENT
INTEL EXPLOITATION
GCCS/C2PC
COMMANDER'S GUIDANCE / FORCE ASSIGNMENT
PRECISION TARGETING & MISSION PLANNING
WEAPON LAUNCH CONTROL
POST LAUCH CONTROL
RETARGET
REDIRECT
WEAPONS
JDAM
JSOW
SLAM-ER
GBU/LGB
Tomahawk
TACTICAL ISR MANAGEMENT
INTEL EXPLOITATION
TACTICAL DECISION AIDS
PLANNING & PRECISION TARGETING
TASK SENSOR FOR COLLECTION
PLAN SENSOR SEARCH
CONTROL SENSOR PLATFORM
CONTROL SENSOR PAYLOAD
DISTRIBUTE DATA
MANAGE WORKFLOW
SCREEN DATA
CORRELATE/FUSE/INTERPRET DATA
PRODUCE INTEL PRODUCTS
ARCHIVE/DISTRIBUTE INTEL PRODUCTS
ASSESS SITUATION
DETERMINE ENEMY INTENT
SELECT TARGETS
DISTRIBUTE ENGAGEMENT ORDERS
WORKFLOW MANAGEMENT
PRECISELY GEOLOCATE
WEAPONEER TARGET
DERIVE WEAPON DELIVERY PARAMS
CALCULATE COLLATERAL DAMAGE
CONDUCT SURVIVABILITY ANALYSIS
DEVELOP STRIKE/FIRE PLAN
PLAN ROUTE
DISTRIBUTE PLANNING/TARGETING INFO

Kill-Chain Enterprises



SOA Concepts

- Services offered over the web and within the enterprise using XML-based standards
- Implementation of services using component-based software engineering (CBSE) architecture
- An architectural, procedural, and organizational mindset that is service-oriented, and which can merge the web services technology and CBSE potential into a synergisitic whole

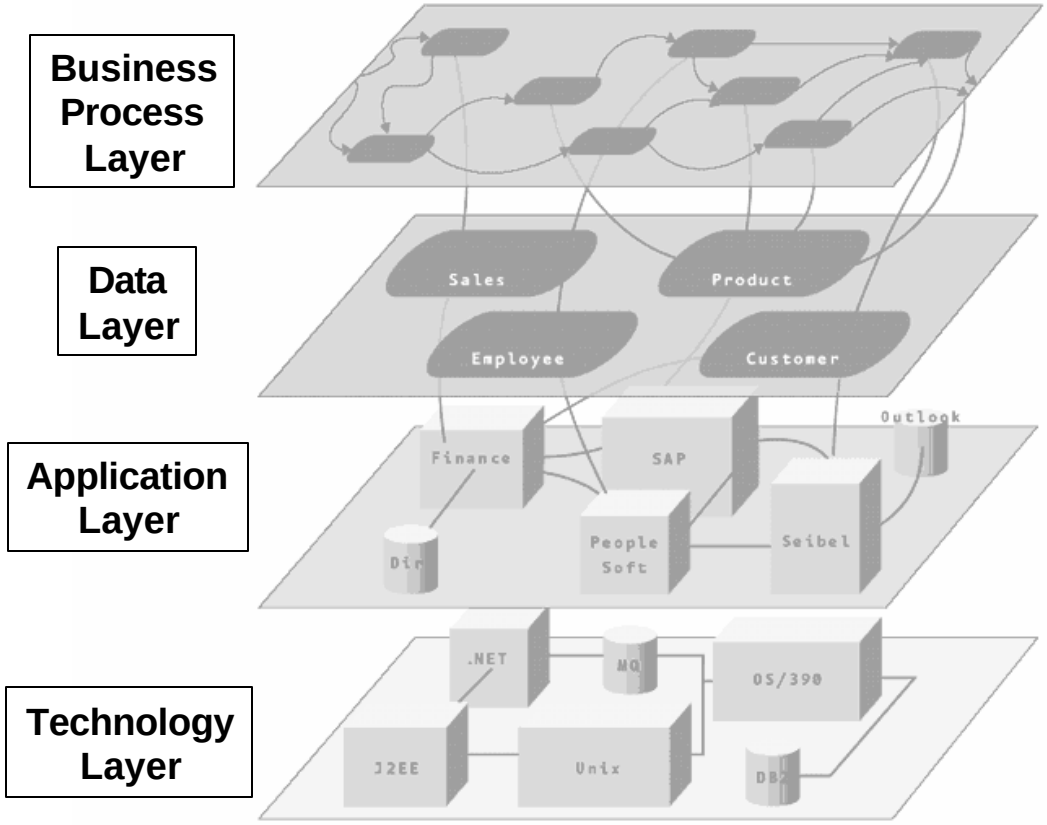
McGovern, James, et al. Enterprise Service Oriented Architectures, The Netherlands: Springer, 2006

SOA Benefits

- Focus on Business Processes
  - Source of Enterprise “Competitive Advantage”
  - Separation of technology platforms from the business services offered, and from the business logic that implements those services
- Speed and Agility
  - Respond quickly to changes in Business Processes
  - Reduce cycle time to implement new Business Processes
- Cost
  - Re-use/Extension of available components and services
  - Federation of services

McGovern, James, et al. Enterprise Service Oriented Architectures, The Netherlands: Springer, 2006

Service Oriented Architecture



Graphic Courtesy of Microsoft Developers Network (MSDN)

Service Oriented Architecture Translation

Industry: Competitive Advantage

Kill Chain: Enterprise Differentiation

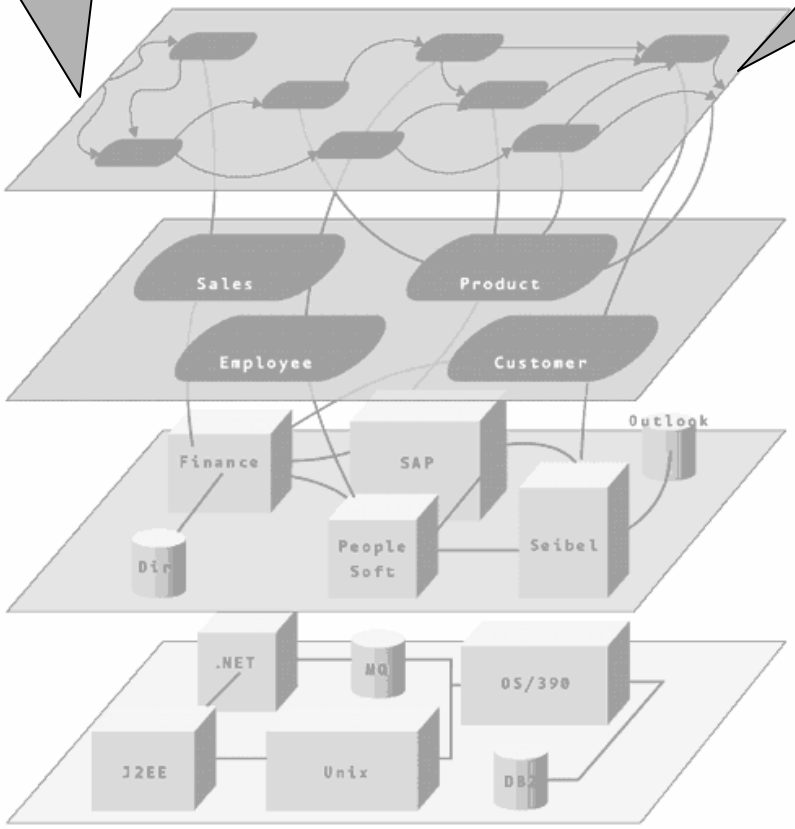
Industry

Business Process Layer

Data Layer

Application Layer

Technology Layer



Strike Planning Equivalency

CONOPS
Workflows
Use Cases
SOP/ROE

Geospatial/Mapping
Imagery
Targets
Intell/OOB
ATO/ACO/SPINS
Mission Plans

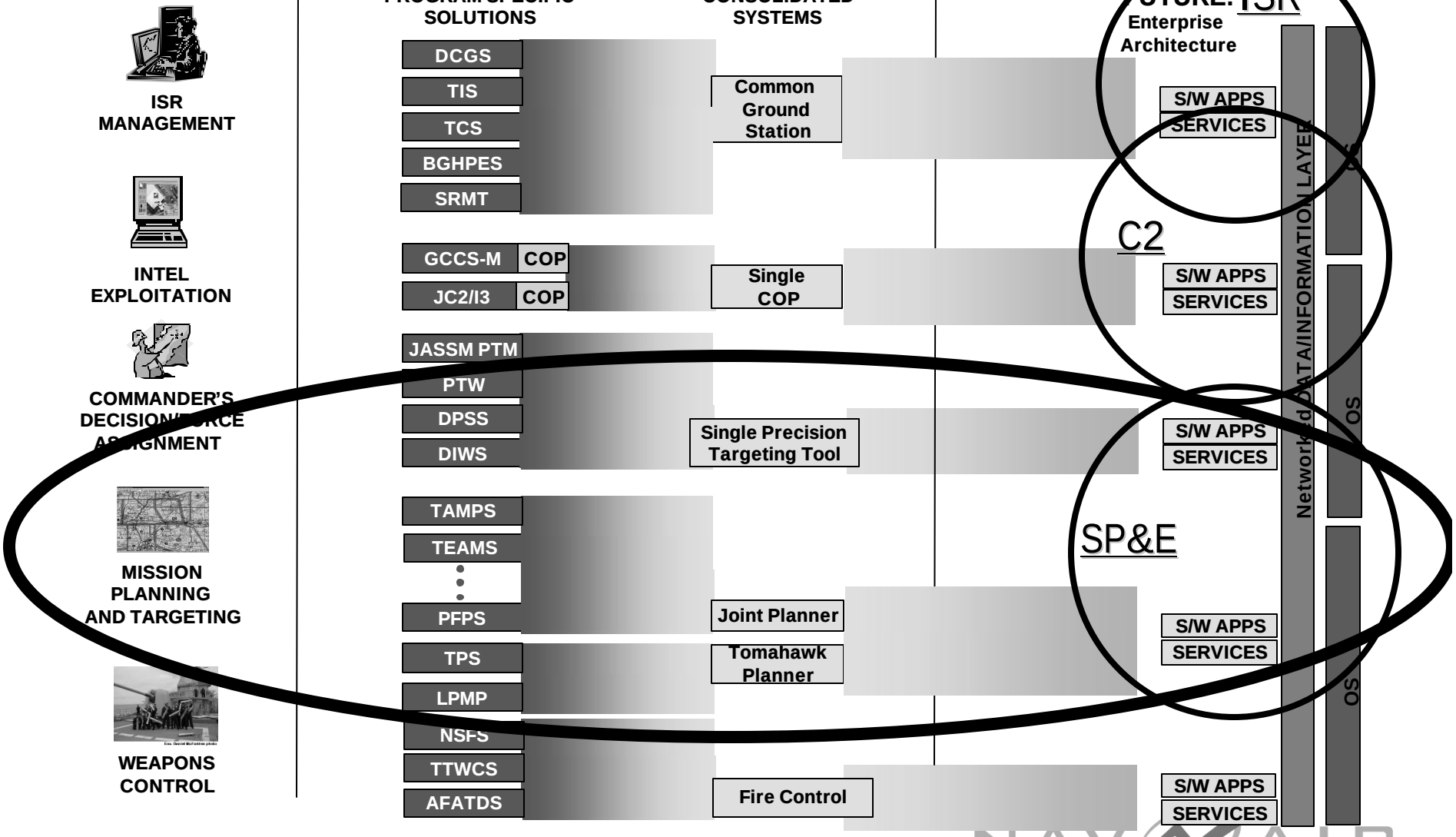
TPS/MDS
JMPS
WASP
PTW
TOPSCENE

Operating Systems
Hardware Suites
Network Infrastructure

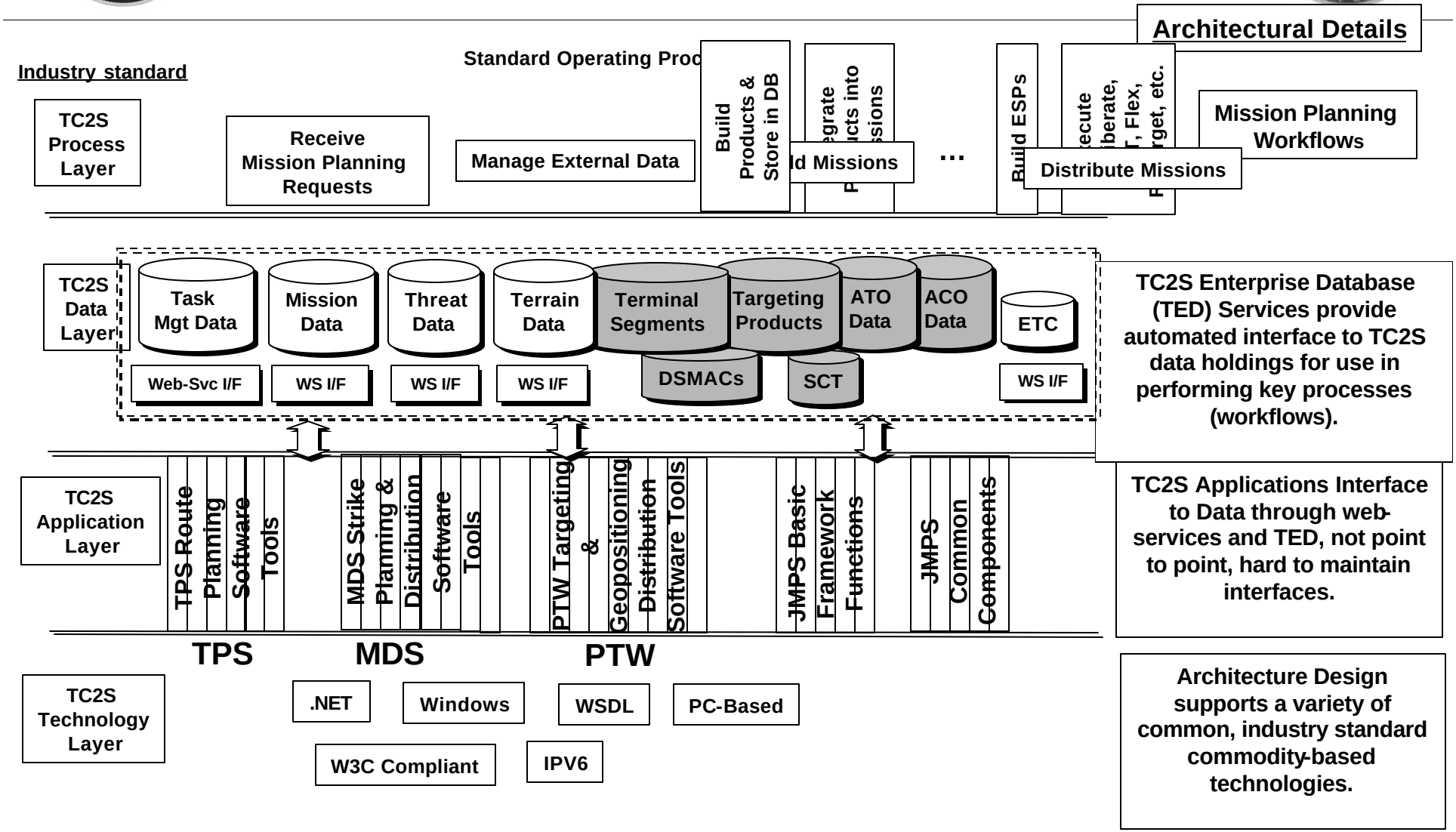
Graphic Courtesy of Microsoft Developers Network (MSDN)

NAVAIR

Architecture Migration



TC2S Architecture Layered View

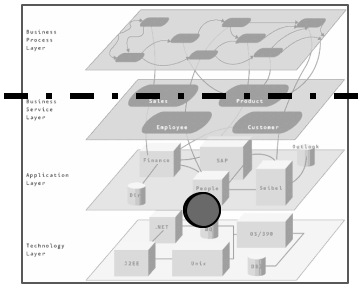


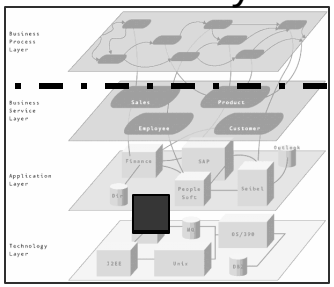
SOA & Joint

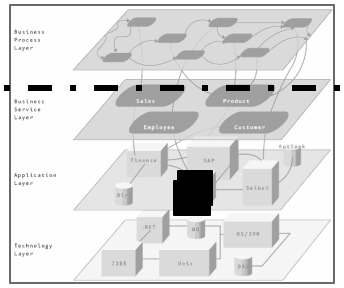
MHq/MOC Systems

AOC/CAOC Systems

NGA (Like) Systems



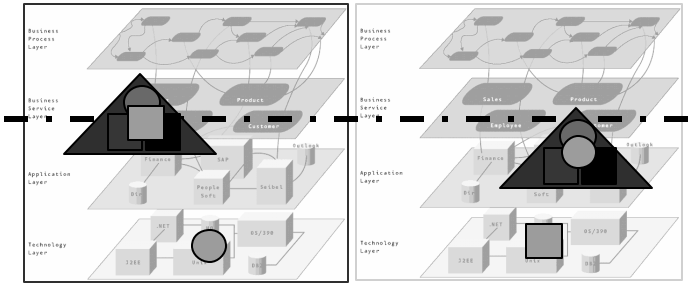




Airwing or C2 Systems

CMSA or C2 Systems

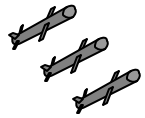
Collaboration Tools
GIG (IP comms)



JMPS TC2S

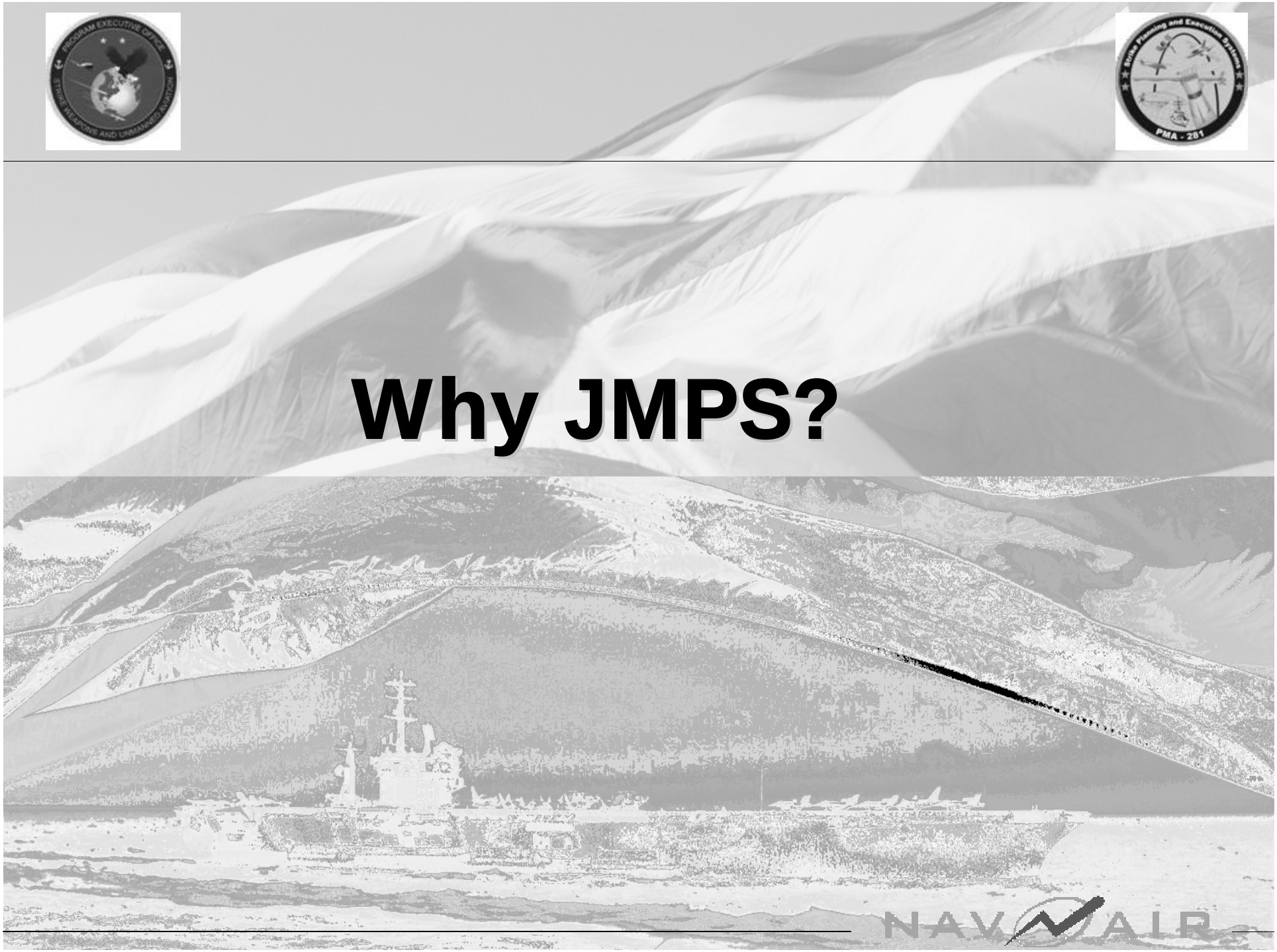
COP

- Don't care where the data is
- Services allow access to data anywhere
- Local applications synthesize products (data/workflow)

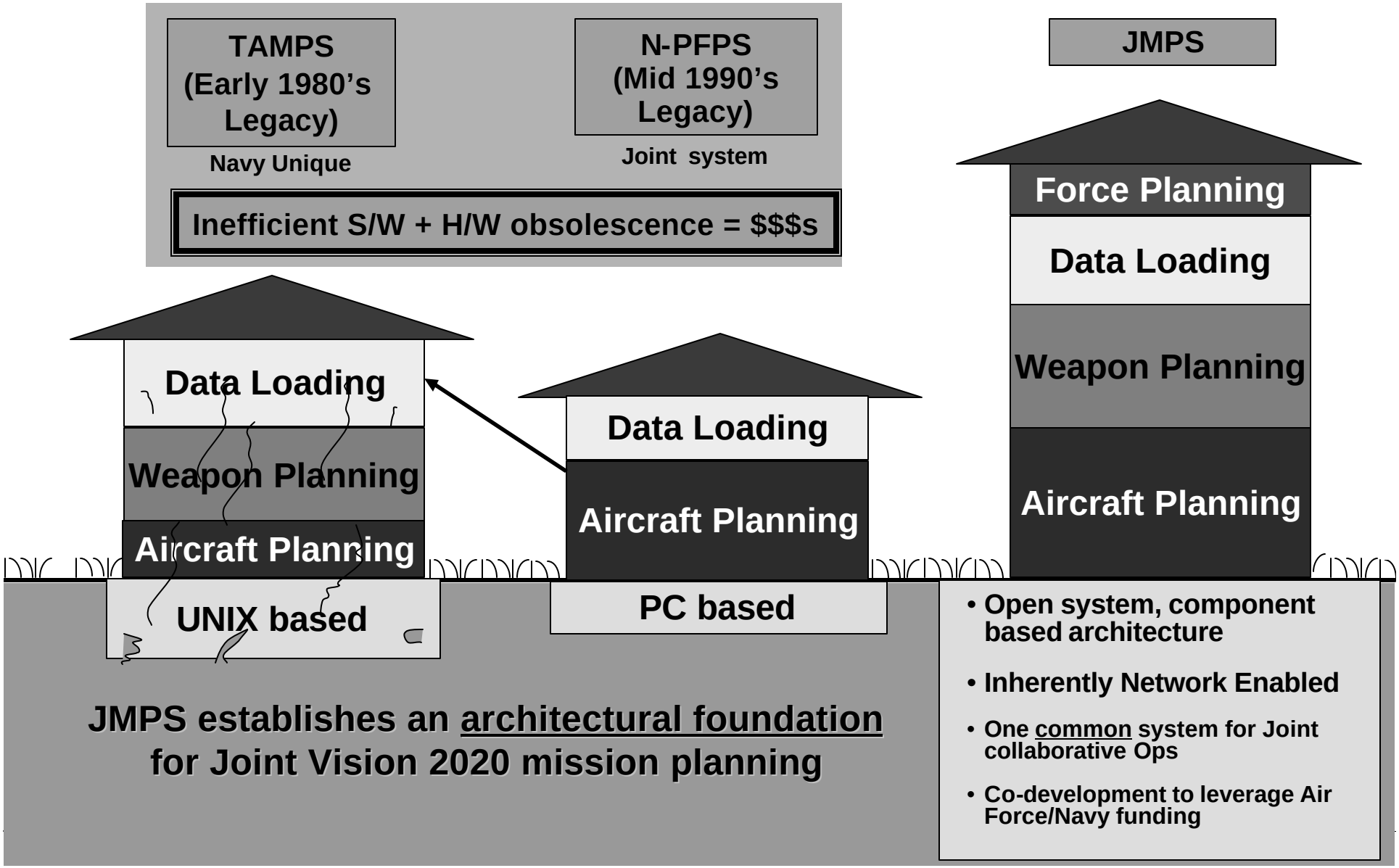


NAVAIR

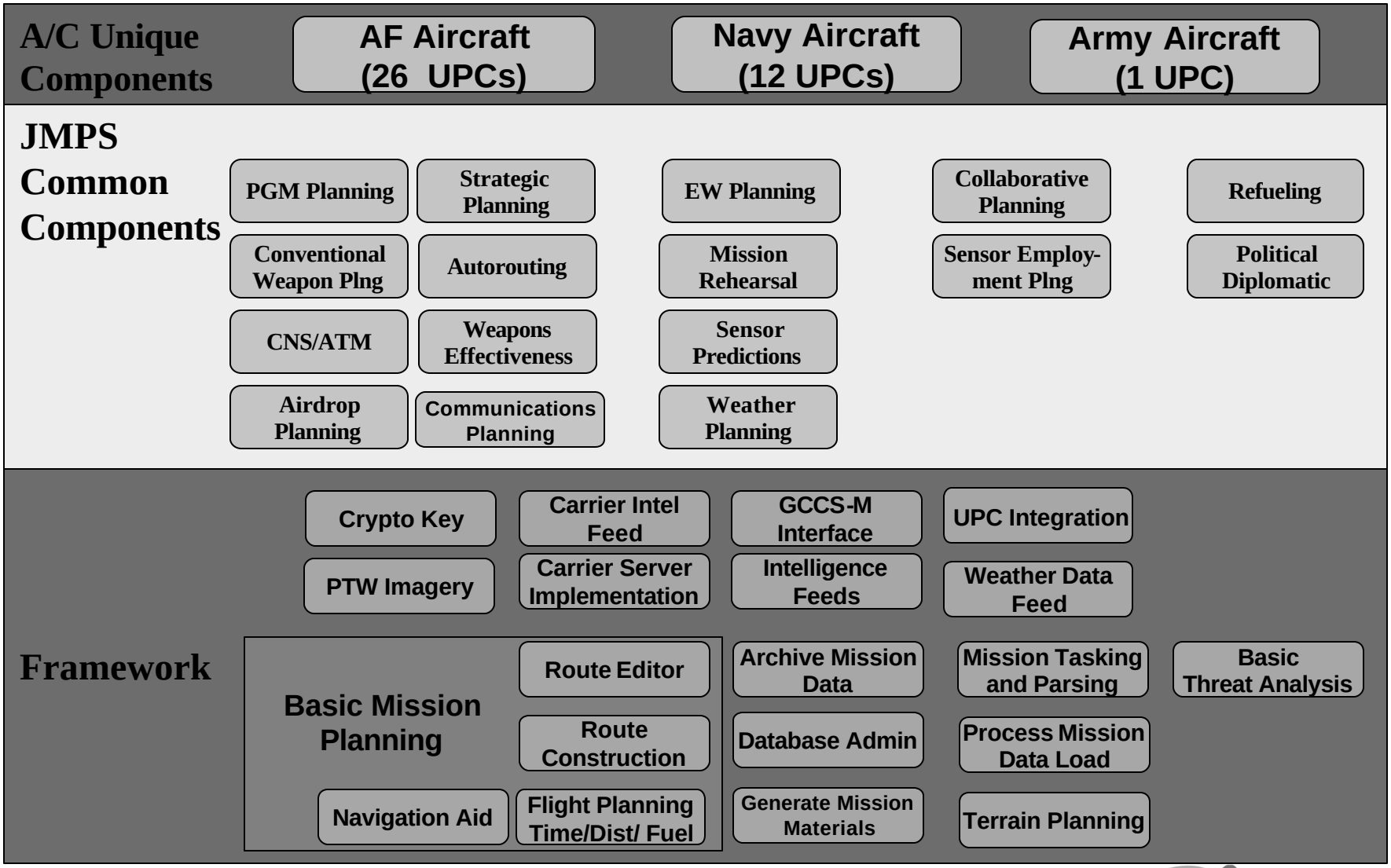
Why JMPS?



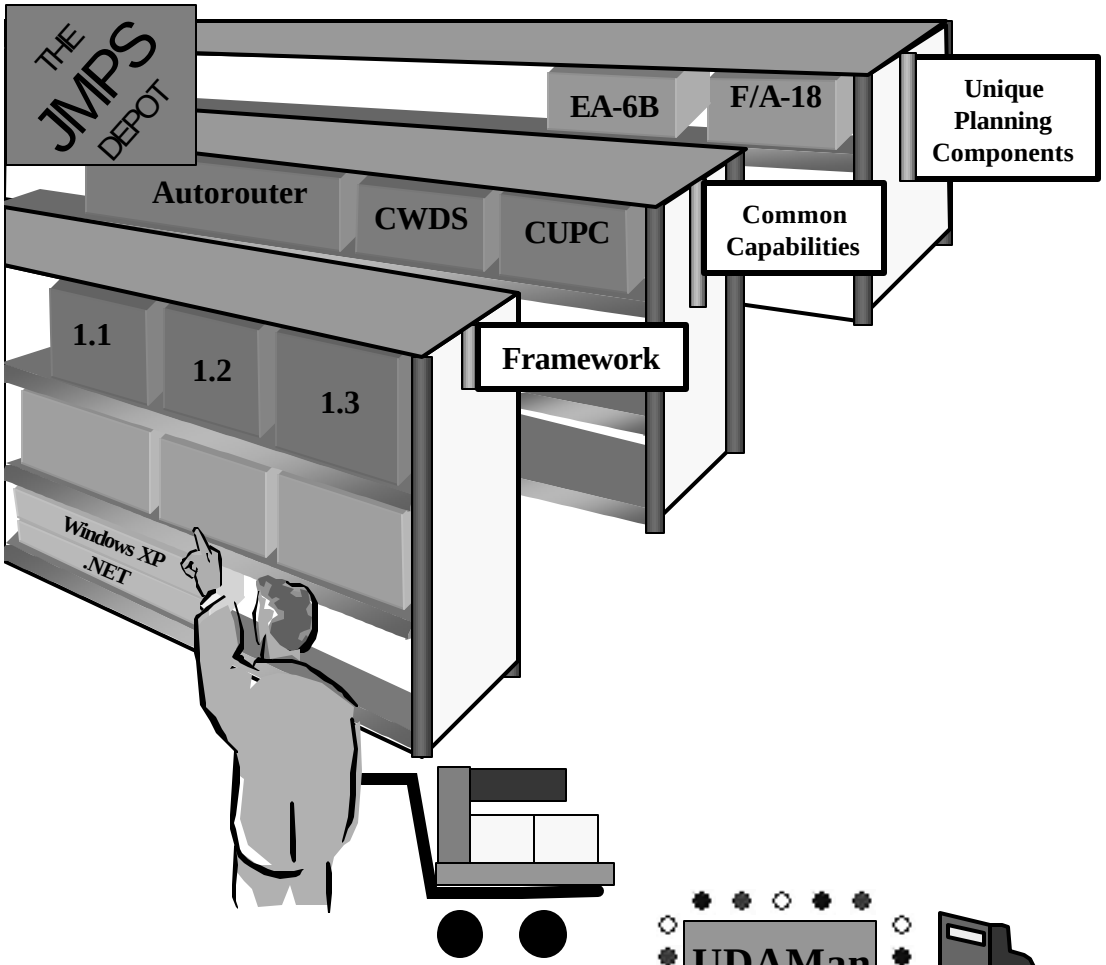
NavMPS Migration

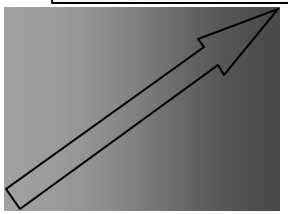


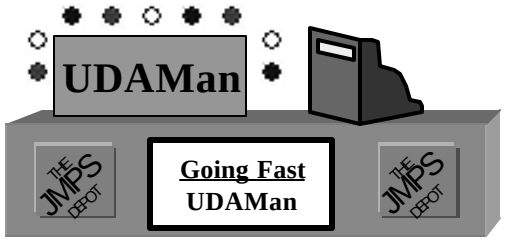
JMPS Overview



Joint Mission Planning System







JMPS F/A-18
Misson Planning Environment

F/A-18 UPC
SLAM-ER
HARM
ETIRMS
TAMMAC
ARC-210
CUPC
GPS Prediction
GPS Crypto Key
GPS Almanac
WASP
Framework

PMA-265 Boeing

PMA-201 Boeing

PMA-242

PMA-234

PMA-209 Boeing

PMA-201 Raytheon

ESC (USAF) Hill AFB

PMA-281 NGMS

Unique Planning Component
Common Component
Framework

NAVAIR

Mission **P**lanning **E**nvironment

Common Helo MPE

UH-1N
CH-53
CH-46
SH-60F
HH-60H

CMDL
Framework 1.2.4

Intel Planning
Mission Rehearsal
Collaboration

Future
Can be added as needed

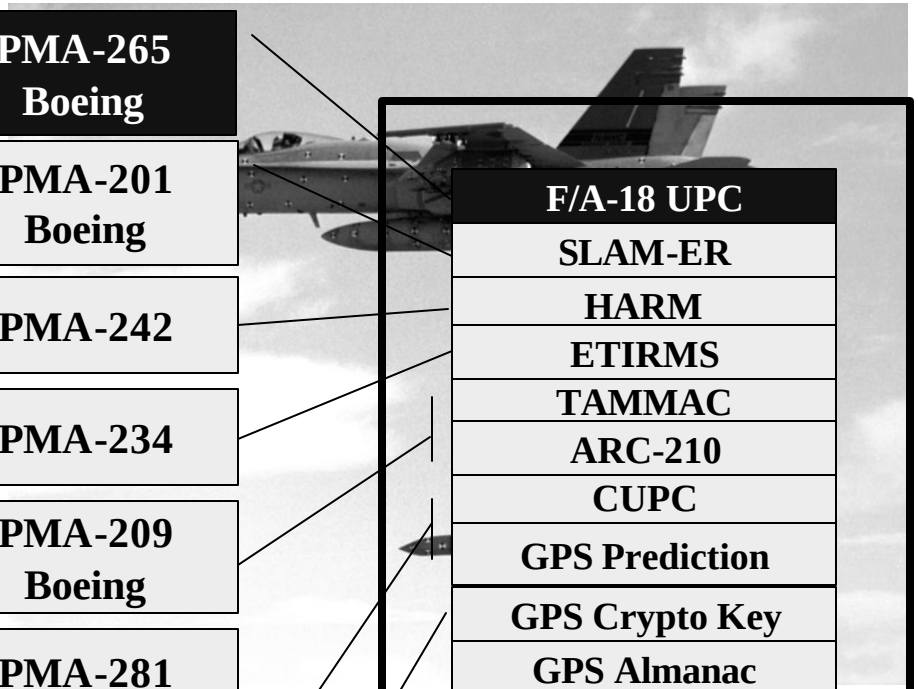
Unique Planning Component

Common Component

Framework

NAVAIR

TLAM Planning to JMPS



PMA-265 Boeing

PMA-201 Boeing

PMA-242

PMA-234

PMA-209 Boeing

PMA-281

PMA-201 Raytheon

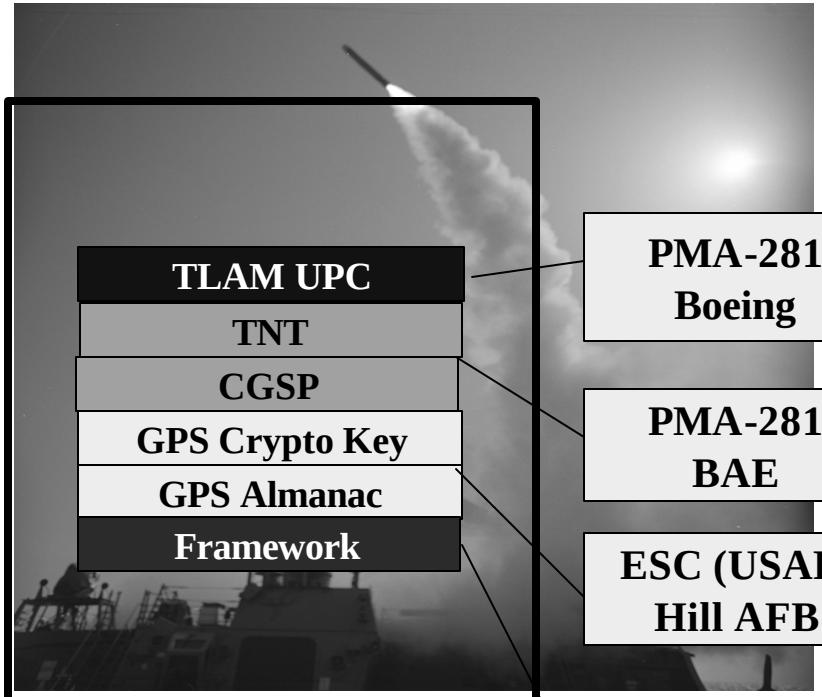
ESC (USAF) Hill AFB

PMA-281 MPEC

F/A-18 UPC

- SLAM-ER
- HARM
- ETIRMS
- TAMMAC
- ARC-210
- CUPC
- GPS Prediction
- GPS Crypto Key
- GPS Almanac
- WASP
- Framework

F/A-18 MPE



TLAM UPC

- TNT
- CGSP
- GPS Crypto Key
- GPS Almanac
- Framework

TLAM MPE

PMA-281 Boeing

PMA-281 BAE

ESC (USAF) Hill AFB

PMA-281 MPEC

PMA-281 Integration/Test/ Support

- Unique Planning Component
- Web Service
- Common Component
- Framework

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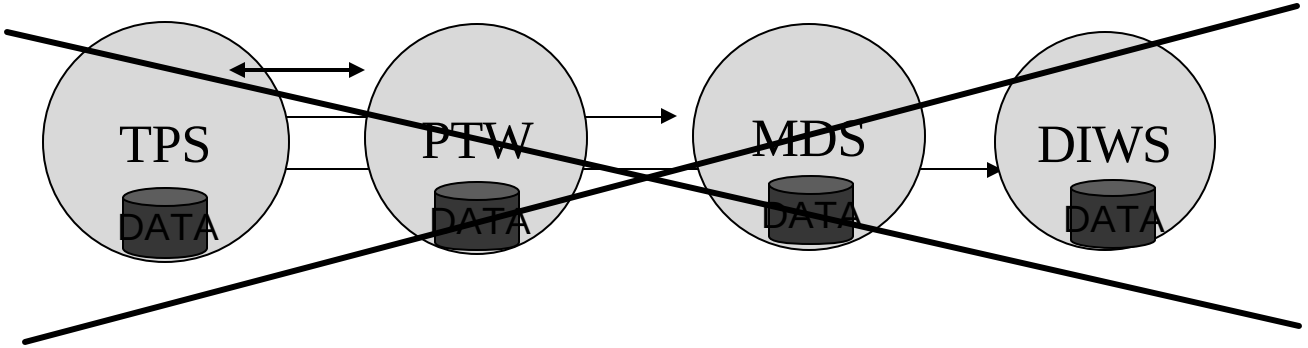
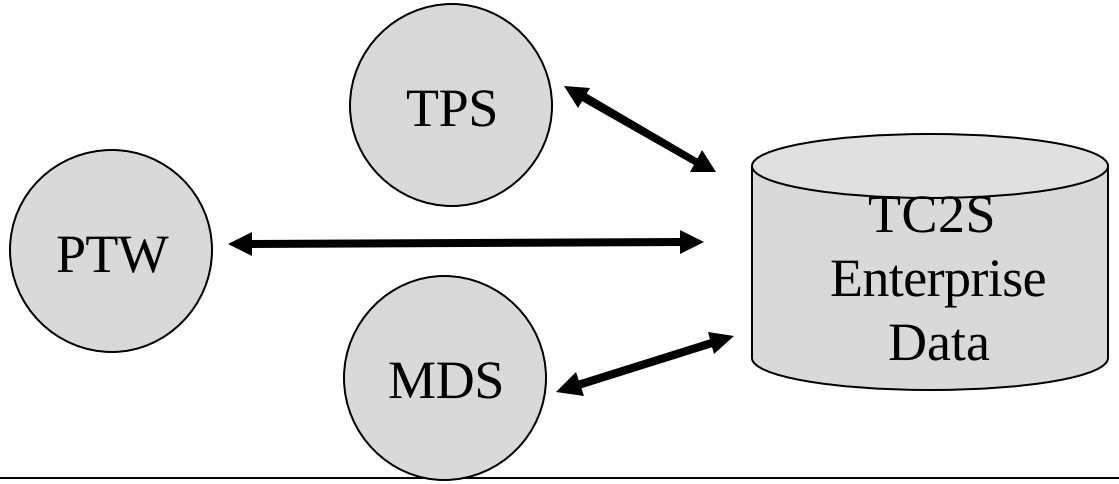
SOA Challenge

- Phase 1: Focus on the data
  - Remove the redundancy (establish TC2S enterprise data holdings)
  - Remove the costly, inefficient interfaces. (applications interact with data rather than each other)



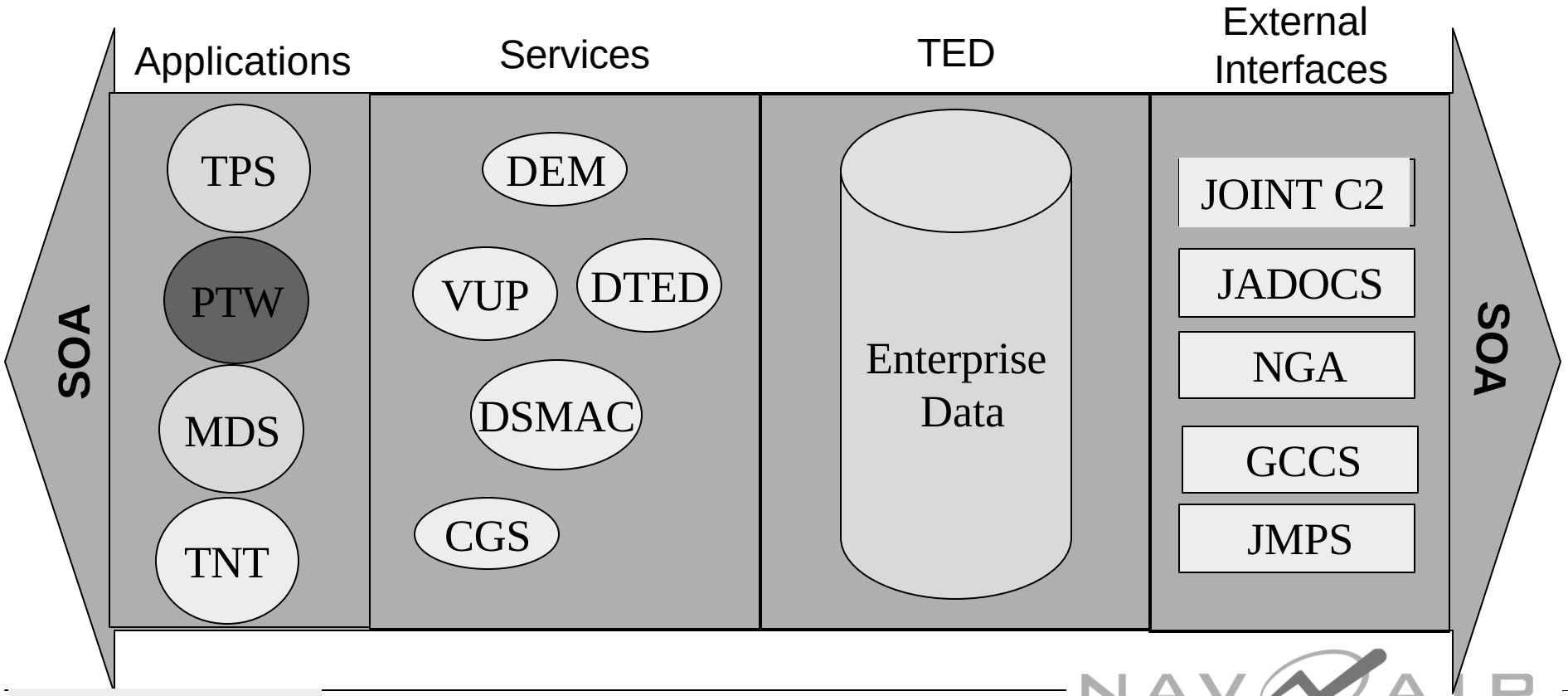
WAS



IS
(TC2S 4.0.7)

SOA Challenge

- Phase 2: Focus on the Functionality
  - Use Net-enabled web-services to provide commonly performed functions (like auto-creation of Digital Elevation Matrices)
  - Introduce PC-based tools for targeting and imagery-based products



Yellow=Way Ahead

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Integrated Strike Planning & Execution

CVN-21

+

CVW "2020"

- (2) F/A-18 E/F
- (2) JSF
- (1) E/A-18G
- (1) E-2C
- (var) MH-60 S/R
- (1) J-UCAS

Key Performance Parameters (KPPs)

- **Manpower Reductions**
- **Net Ready**
- **Survivability**
- **Force Protection**
- **Sortie Generation Rate (SGR)**
  (Surge / Sustain)
  Threshold 270 / 160
  Objective 310 / 220

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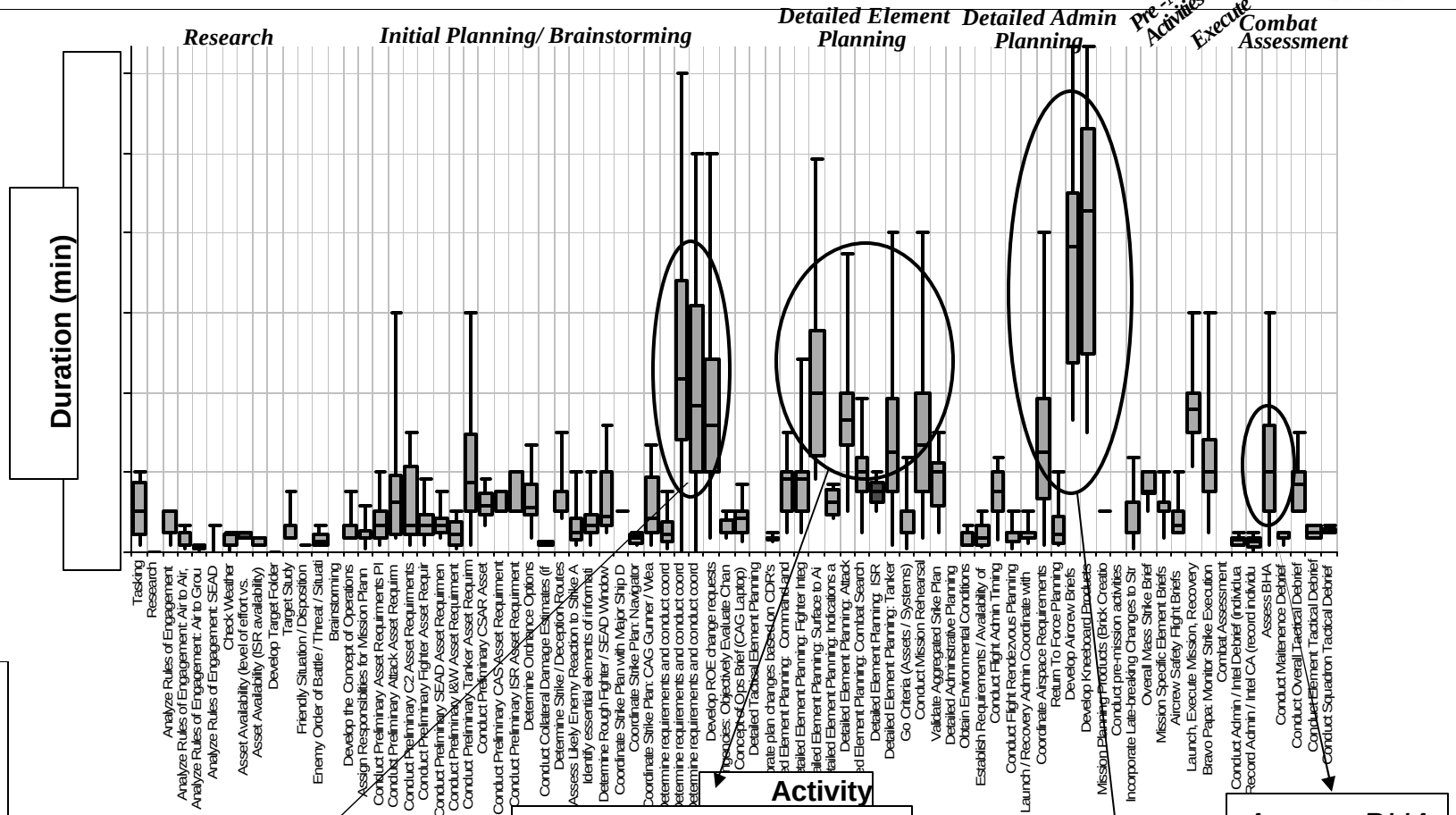
Requirement Drivers

- CVN-21 Throughput and Manning
  - Sortie generation rate
  - Aimpoints “serviced”
  - Automation...
- Time Sensitive Targets
  - Use “pre-planned” processes for TST
- Network-Centric Operations
  - Data visibility
  - Use of Distributed Services
  - Updated system architecture...

Strike Planning - The "Long Poles"



Maximum

75% Data

50% Data

25% Data

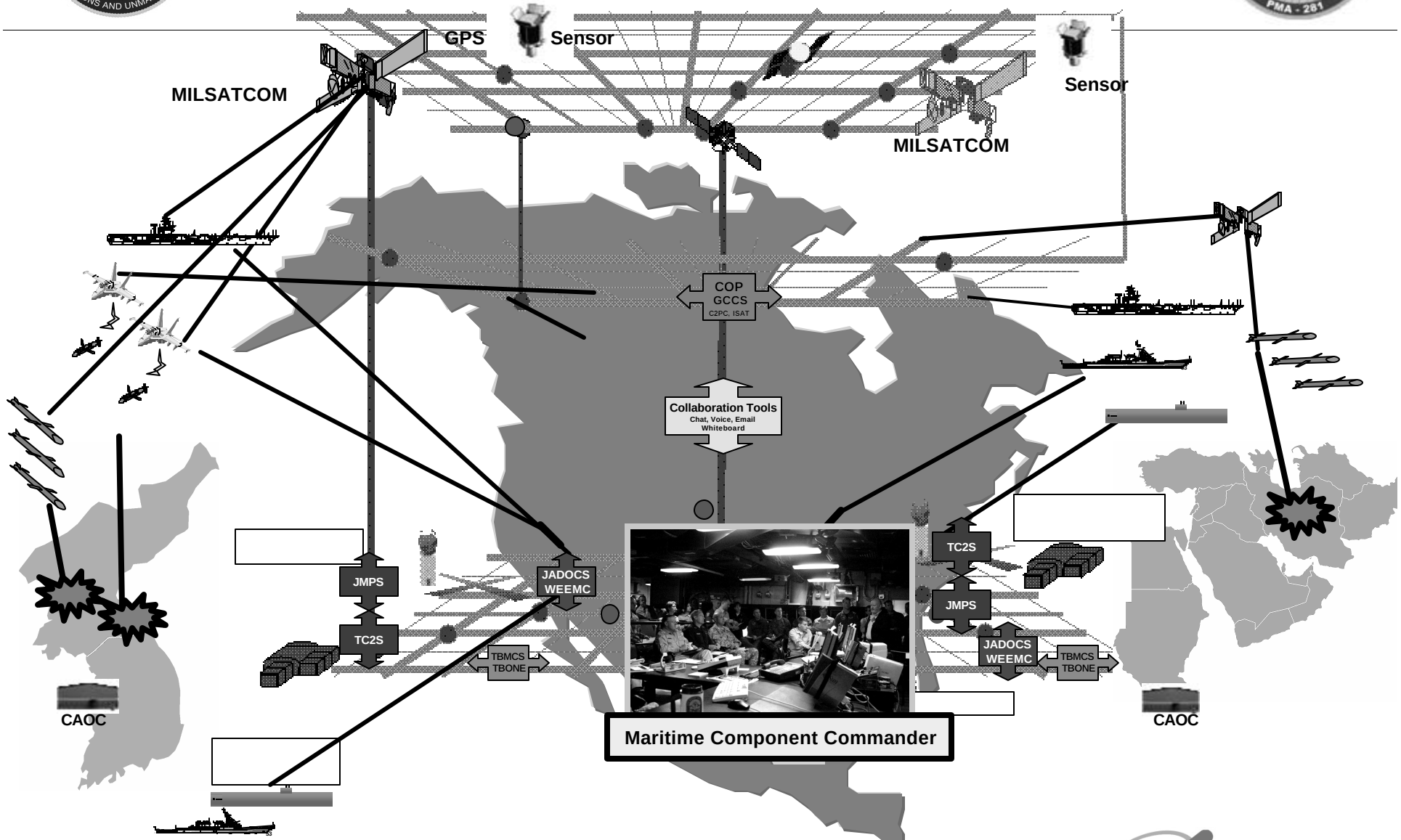
Minimum

Coordinate with Partners
Coordinate with ISR
ROE/Guidance changes

Detailed SEAD
Detailed Attack
Detailed CSAR
Detailed tanker
Mission rehearsal
Validate strike plan

Coord airspace reqts
Aircrew briefs

Future Vision



The Global War on Terrorism
The Long War

Brigadier General Mark O. Schissler, USAF
Deputy Director for the War on Terrorism
The Joint Staff

This Briefing is **UNCLASSIFIED**

Agenda

- **The current environment**
- **Understanding the enemy**
- **Understanding our strategy**

- ***To the average American, the threat to the U.S. is difficult to comprehend***
- ***Sustained war is alien to the peaceful nature and desires of our nation***

When Was America Attacked?

1979 – Iranian Hostage Crisis
1983 – Embassy & Marine Barracks Bombing, Lebanon
1984 – Embassy Official kidnapped and murdered, Lebanon
1985 – TWA Hijacking, U.S. sailor murdered
– *Achille Lauro* Hijacking, American murdered
1988 – U.S. Marine kidnapped and murdered, Lebanon
– USO Attacked, Italy
1993 – World Trade Center bombing
1995 – Saudi Military Installation Attack
1995-1997 – Palestinian terrorist attacks murdered Americans
1996 – Khobar Towers Bombing, Saudi Arabia
1997 – Empire State Building Sniper Attack
1998 – Embassy Bombings, Kenya & Tanzania
2000 – U.S.S. Cole Bombing, Yemen
2001 – Philippines Hostage Incident
– World Trade Center, Pentagon, Shanksville, PA

Nature of the Conflict

Muslim Society

Extremist Influence

Leverage Grievances:

- **"Islam is Under Attack"**
- **All Muslims must rise to the defense of Islam**
- **Re-establish Islamic states under strict Sharia Law**
- **Restore the preeminence of the Muslim world**

Values

- **Religious**
- **Hospitable, gracious**
- **Family, tribal loyalty**
- **Education**

***GRIEVANCES—both perceived and real*:**

- ***Local***: **Corrupt and ineffective political, economic, and social systems**
- ***Regional***: **Bias in US policies, (Palestine, Kashmir, Iraq, etc); heavy handed US operations, occupation of Islamic lands**
- ***Global***: **Infusion of Western culture corrupting society**

RESULT: anger, humiliation, and disenfranchisement

Does political activism or violent militancy result?

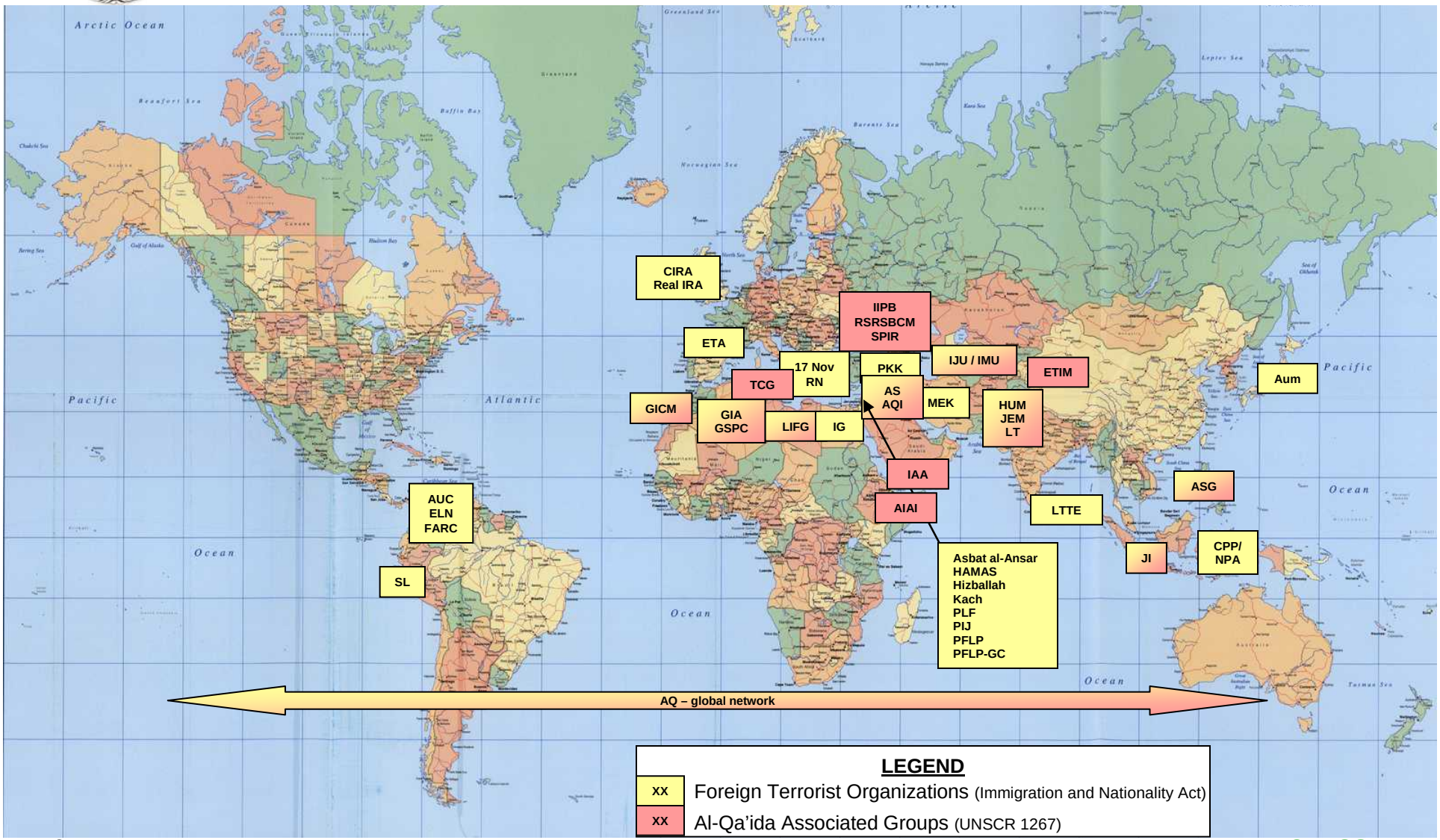
Who is the enemy?

- **"a transnational movement of extremist organizations, networks, and individuals – and their state and non-state sponsors – which have in common that they exploit Islam and use terrorism for ideological ends."**
- **Al-Qa'ida Associated Movement is most dangerous**
- **Other violent extremist groups also pose a serious and continuing threat**

<u>Nature of the Enemy</u>

- Represent no nation
- Do not mass armies or warships
- Defend no territory
- Wear no uniform
- Operate in shadows, conspire in secret, attack without warning

Global Terrorists



Increased Capabilities

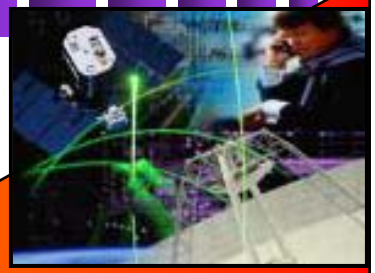
The ability of the terrorists to leverage technology and their increased access to weaponry expands their potential lethality.

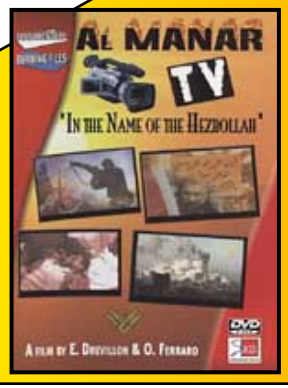
"Acquiring chemical and nuclear weapons for the defense of Muslims is a religious duty."
- Usama bin Laden

Increased Communications

Communications technology extends their reach from a local audience to the world stage – Communications enables them to incite a global movement in real time

Information Sharing Capabilities





Individual → National → Regional → Global

"In the absence of popular support, the Islamic mujahed movement would be crushed in the shadows, far from the masses who are distracted or fearful."
- Aymen al-Zawahiri

Increased Ambitions

The terrorists leverage a frustrated population, effective communications and improved weaponry to target the overthrow of existing governments – establishing an extreme, repressive and violent social order

What is a Jihad?

Jihad is a state of mind. Peace under this mental framework can only occur when there is only one global power and all "infidels and apostates" have been converted or subverted to the will of Allah. Some believe there have been five major time periods of violent Jihad:

The "First Global Jihad" 622-early 1500s

The "Second Global Jihad" 1620-1798

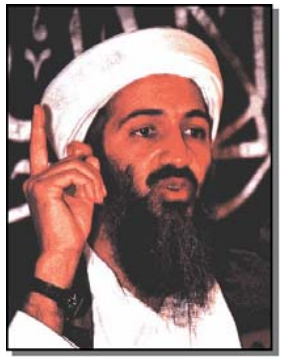
The "Third Global Jihad" 1798-early 1920s

The Fourth Jihad 1921-1979

The Fifth Jihad 1979-Present

Each period of Jihad ended when Muslim introspection led to fear that Allah was punishing the community for not sufficiently following the true faith.

Al-Qa'ida's Plan



"We are seeking to incite the Islamic Nation to rise up to liberate its land and to conduct Jihad for the sake of God." – Usama bin Laden

"If our intended goal in this age is the establishment of a caliphate … [then] the jihad in Iraq requires several incremental goals:"

- "Expel the Americans from Iraq."
- "Establish an Islamic authority or emirate, then develop it and support it until it achieves the level of a caliphate – over as much territory as you can to spread its power in Iraq…."
- "Extend the jihad wave to the secular countries neighboring Iraq."
- "Clash with Israel, because Israel was established only to challenge any new Islamic entity."

Source: Letter from al-Zawahiri to al-Zarqawi, 9 July 2005

Violent Extremist's Long View

Iraq has become the focus of the enemy's effort.
If they win in Iraq, they have a base from which to expand their terror.

Result

- **Strongest army in the world**
- **Strongest currency in the world**
- **Largest country in the world**
- **Atomic and super power country**
- **Half of world population in Islamic State**

Al-Qa'ida's Twenty-Year Plan

Seven Stages

1. "The Awakening," began in 2001
2. "Eye-Opening," 2003
3. "Arising and Standing Up," 2007
4. Demise of Arab governments, 2010
5. Islamic Caliphate, 2013
6. "Total Confrontation," 2016
7. "Definitive Victory," ends in 2020

What are the Enemy's Weaknesses?

- **Violence and intimidation are their primary tactics**
- **Oppressive, backward vision for the future**
- **Multiple cultural, religious and language dimensions**
- **Growing effective and legitimate governance erodes support and provides an alternative**

So what do we need to do? What is our strategy?

National Strategic Framework for the GWOT

"We must take the battle to the enemy, disrupt his plans and confront the worst threats before they emerge. In the world we have entered, the only path to safety is the path of action." — *President George W. Bush*

Ends

Strategic Aims:

- *Defeat violent extremism as a threat to our way of life as a free and open society, and*
- *Create a global environment inhospitable to violent extremists and all who support them*

Ways

Protect and defend the Homeland and U.S. interests abroad

Attack terrorists and their capacity to operate effectively at home and abroad

Support mainstream Muslim efforts to reject violent extremism

- Expand foreign partnerships and partnership capacity
- Strengthen our capacity to prevent terrorist acquisition and use of WMD
- Institutionalize domestically and internationally the War on Terror

Means

Instruments of National Power

National Military Strategic Plan for the WOT

Ends

***Strategic Goal**: Preserve and promote the way of life of free and open societies based on the rule of law, defeat terrorist extremism as a threat to our way of life, and create a global environment inhospitable to terrorist extremists.*

Enemy

Leadership | *Safe Havens* | *Finance* | *Communication*

Movement | *Intelligence* | *Weapons* | *Personnel* | *Ideology*

Ways

Military Strategic Objectives

Protect the Homeland

Disrupt and Attack Terrorist Networks

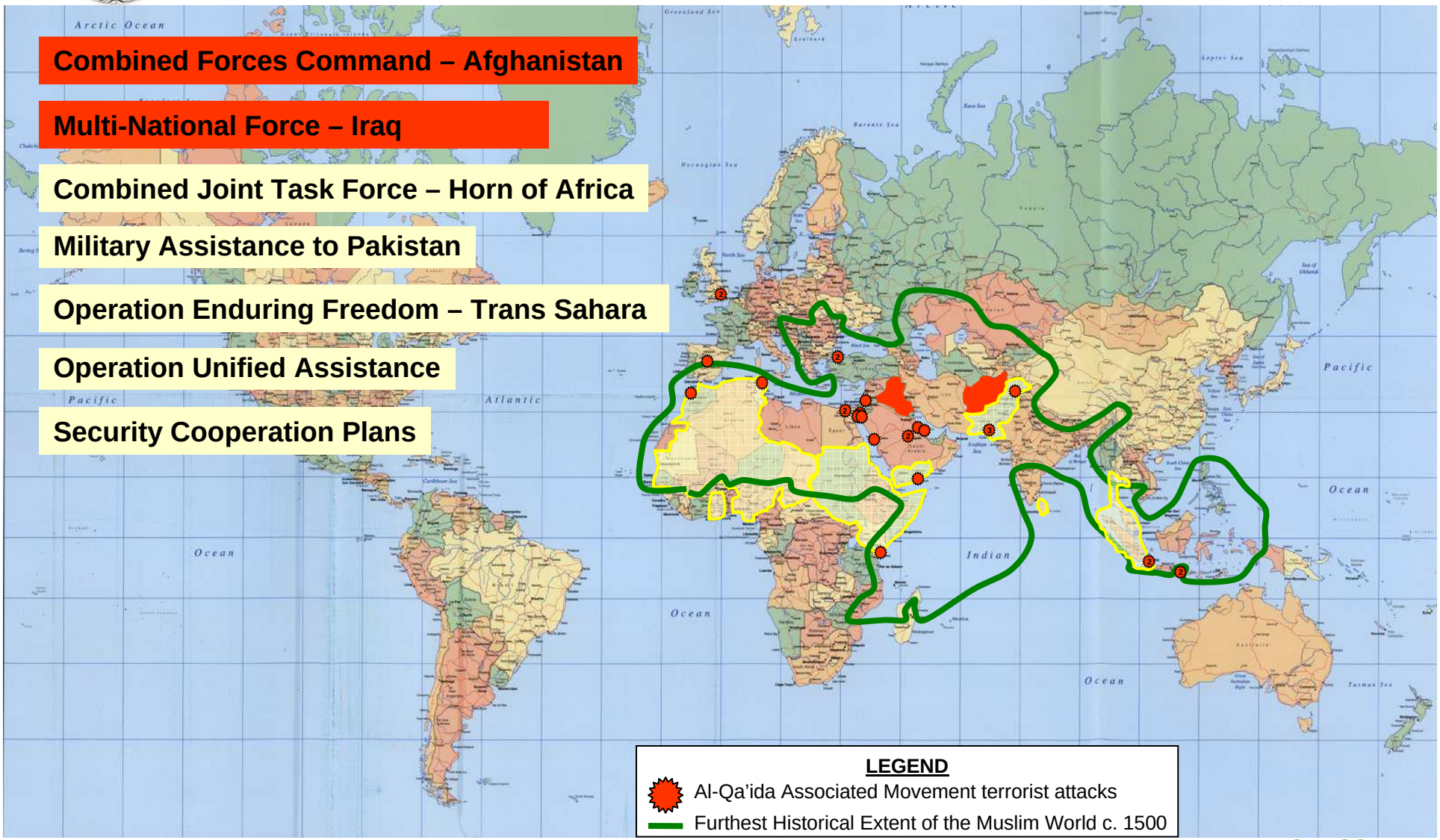
Counter Ideological Support for Terrorism

- *Deny terrorists the resources they need to operate and survive.*
- *Enable partner nations to counter terrorism.*
- *Deny WMD/E proliferation, recover and eliminate uncontrolled materials, and maintain capacity for consequence management.*
- *Defeat terrorists and their organizations.*
- *Counter state and non-state support for terrorism in coordination with other U.S. Government agencies and partner nations.*
- *Contribute to the establishment of conditions that counter ideological support for terrorism.*

Means

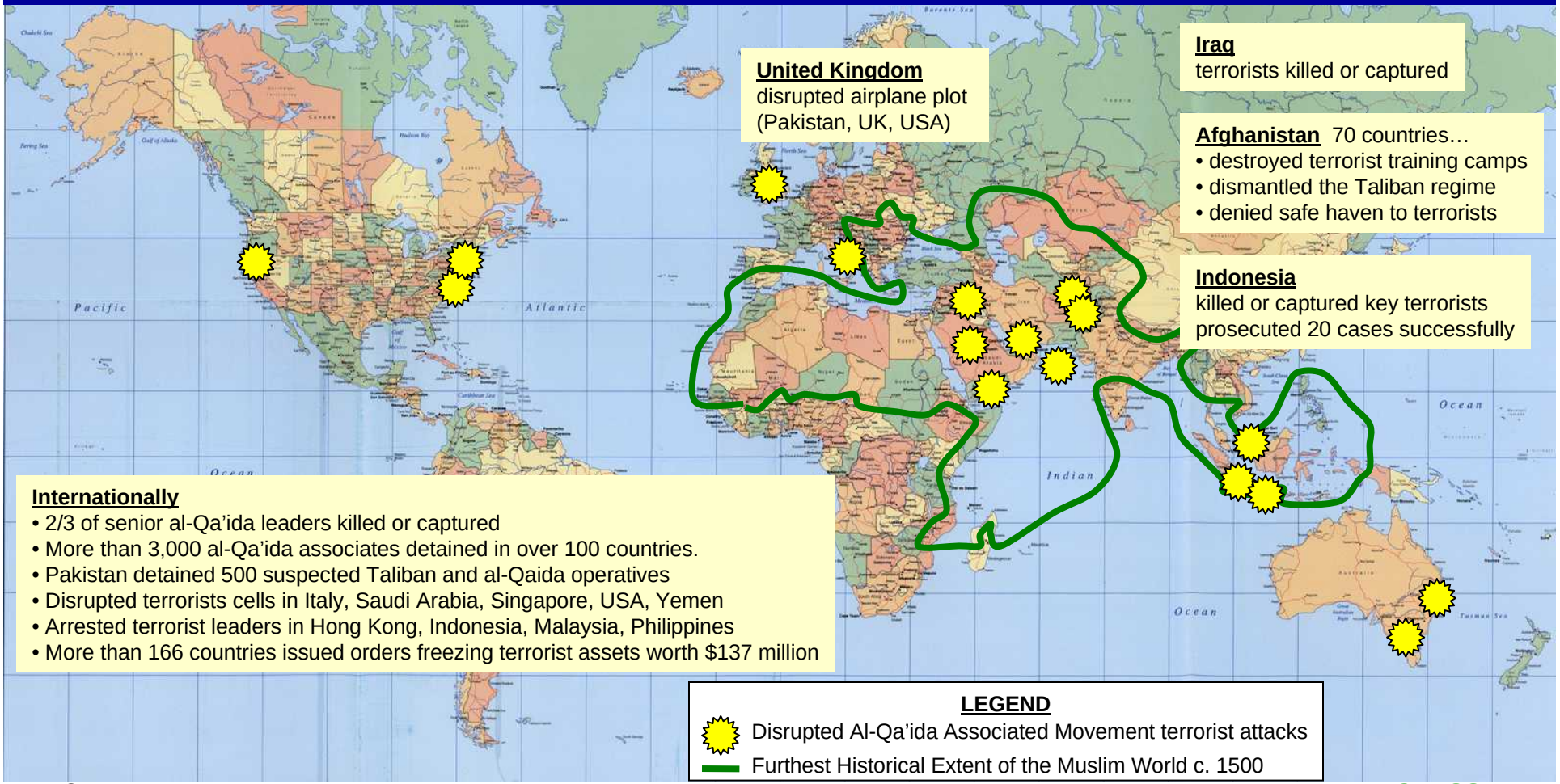
Combatant Commands, Services, and Combat Support Agencies

U.S. Military Efforts in the Global War on Terrorism



Disrupted Terrorist Attacks Since September 11, 2001

"The Global War on Terrorism will continue to be a long and difficult war affecting the entire global community. Success in this war depends on close cooperation among … the combined efforts of the international community."
–Chairman of the Joint Chiefs of Staff



United Kingdom
disrupted airplane plot (Pakistan, UK, USA)

Iraq
terrorists killed or captured

Afghanistan 70 countries…
- destroyed terrorist training camps
- dismantled the Taliban regime
- denied safe haven to terrorists

Indonesia
killed or captured key terrorists
prosecuted 20 cases successfully

Internationally
- 2/3 of senior al-Qa'ida leaders killed or captured
- More than 3,000 al-Qa'ida associates detained in over 100 countries.
- Pakistan detained 500 suspected Taliban and al-Qaida operatives
- Disrupted terrorists cells in Italy, Saudi Arabia, Singapore, USA, Yemen
- Arrested terrorist leaders in Hong Kong, Indonesia, Malaysia, Philippines
- More than 166 countries issued orders freezing terrorist assets worth $137 million

LEGEND
Disrupted Al-Qa'ida Associated Movement terrorist attacks
Furthest Historical Extent of the Muslim World c. 1500

Defeating an Extremist Ideology: Takes Time

"The Islamic Radical threat of this century greatly resembles the bankrupt ideology of the last.... In many ways, this fight resembles the struggle against communism in the last century."
-President Bush, 6 October 2005

Communism

- The repressive and militaristic manifestation was countered by the United States throughout the Cold War with the concerted effort of all instruments of national power
- Ideology was replaced by a democratic ideology with independent states

Similarities with the Global War on Terrorism

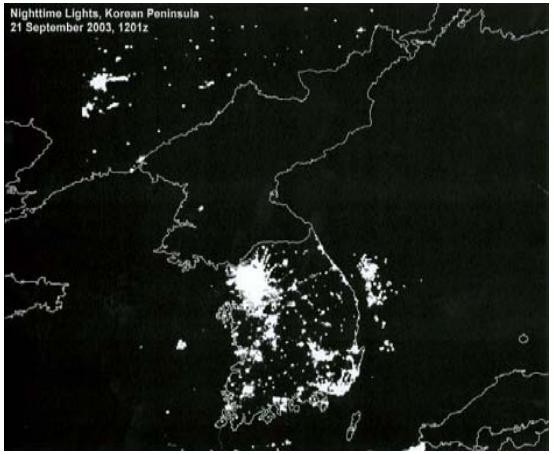
- Long, sustained struggle, punctuated by periods of military conflict
- Use of all elements of national power to win
- Transition of past arrangements to arrangements better suited for a new era
- Required perseverance by the American people and their leaders

Cold War Institution/Program Development

- Marshall Plan, Truman Doctrine, Radio Free Europe, World Bank, NATO, United Nations, International Monetary Fund

"Some of you may ask: when and how will the Cold War end? I think I can answer that simply; the Communist world has great resources and it looks strong, but there is a fatal flaw in their society. Theirs is … a system of slavery. There is no freedom in it, no consent …I have a deep and abiding faith in the destiny of free men. With patience and courage, we shall some day move on into a new era."
President Harry S. Truman, 1953

Building Capacity: Takes Time – South Korea



In 1953 – at the end of the Korean War,

- Was devastated by Japanese occupation and the war with the north
  - Natural, human, and manmade resources were destroyed
  - Had a 95% illiteracy rate and no record of national governance
  - Gross Domestic Product was equivalent to the poorest Asian and African Countries

In 2006 – 53 years later,

- Is known as one of the "Asian Tigers" – one of the top four Asian economies
- GDP has grown to match those within the European Union
- A stable and legitimate democratic government with a free market economy
- No longer requires large amounts of American support for survival

Other Long Term Examples of Success,

- Germany, Japan

"For … the global community, the withering away of the state is not a prelude to utopia but to disaster … These weak states have posed threats to international order because they are the source of conflict and … because they have become the potential breeding grounds for a new kind of terrorism that can reach into the developed world."

Francis Fukuyama, State Building, Cornell University Press, 2004.

Conclusion

- **The Muslim population is key; perceived grievances provide inroads for violent extremists**
- **Our enemy is <u>not</u> 10 feet tall; we know his strategy and his weaknesses**
- **The United States strategy addresses the essential elements for success**

- **Success requires perseverance; not necessarily combat**
  - **Reverse grievances in the Muslim World**
  - **Discredit violent extremist ideology**
  - **Build partner nation capacity**

Final Thought

"…There is a view…that 'democracy' means the system of government evolved by the English-speaking peoples. Any departure from that is either a crime to be punished or a disease to be cured. I beg to differ…Different societies develop different ways of conducting their affairs, and they do not need to resemble ours…after all, American democracy after the War of Independence was compatible with slavery for three-quarters of a century and with the disenfranchisement of women for longer than that. Democracy is not born like the Phoenix. It comes in stages, and the stages …differ from…society to society…"

- Bernard Lewis, 2006

National Military Strategic Plan for the War on Terrorism:
http://www.jcs.mil/

BACKUP SLIDES

Questions

Reminiscent of the Cold War…

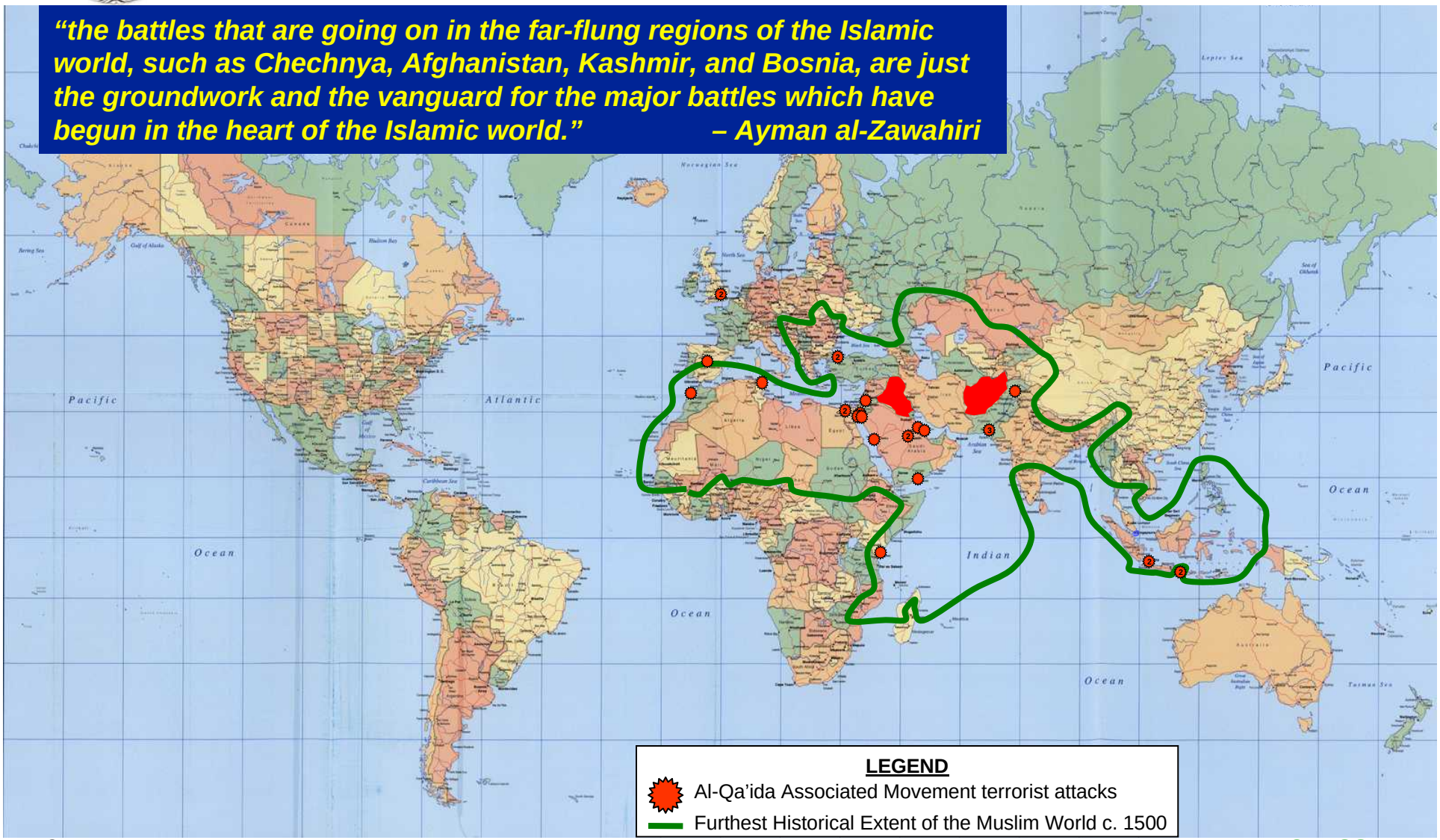
"The ultimate determinant in the struggle now going on for the world will not be bombs and rockets but a test of wills and ideas - a trial of spiritual resolve: the values we hold, the beliefs we cherish and the ideals to which we are dedicated."

– President Ronald Reagan, 1982

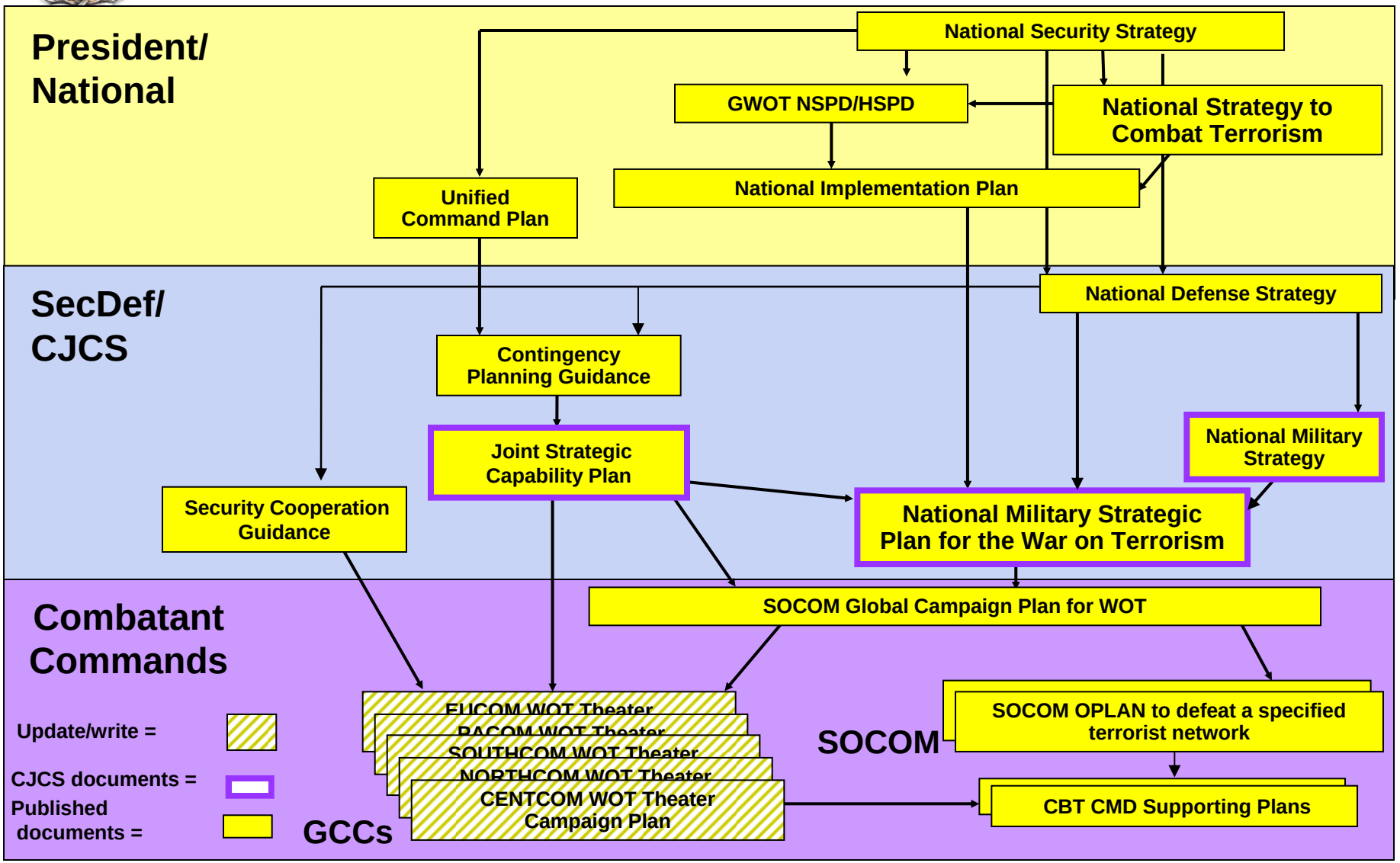
National Military Strategic Plan for the War on Terrorism:
http://www.jcs.mil/

Al-Qa'ida Attacks since September 11, 2001

"the battles that are going on in the far-flung regions of the Islamic world, such as Chechnya, Afghanistan, Kashmir, and Bosnia, are just the groundwork and the vanguard for the major battles which have begun in the heart of the Islamic world." – Ayman al-Zawahiri



Strategic Guidance



Institutionalizing the War on Terrorism

Roles & Responsibility
NSPD 1

National Security Council (NSC)
Homeland Security Council (HSC)

Actions
NSPD-46/HSPD-15
National CT Strategy

IA forum for development, coordination, and implementation of CT-related policy & strategy

Counter-Terrorism Security Group (CSG)

Monitor planning development and provide recommendations to the NSC and HSC.

Coordinate & synchronize agencies and monitor & evaluate implementation of plans

National Counter-Terrorism Center

Develop a *National Implementation Plan (NIP)* – National plan that implements and synchronizes all elements of national power and influence

Provide representation to committees, support planning at the NCTC and implement plans

USG Agencies & Departments

Develop a *Department-Specific Supporting Plans* – Plans that articulate the approach of each agency and department to support the NIP

State | **Justice** | **DHS** | **Commerce** | **USTR** | **Agriculture** | **Treasury** | **Defense** | **CIA** | **Joint Staff**

Inter-Department Coordination and Agreements

National Strategy to Combat Terrorism

Strategic Aims:

- ***Defeat violent extremism as a threat to our way of life as a free and open society, and***
- ***Create a global environment inhospitable to violent extremists and all who support them***

Long Term Approach

Advance Democracy

Short Term Approach

(4 Priorities of Action)

1. **Prevent Attacks by Terrorist Networks**
2. **Deny WMD to Rogue States and Terrorist Allies Who Seek to Use Them**
3. **Deny Terrorists the Support and Sanctuary of Rogue States**
4. **Deny Terrorists Control of Any Area They Would Use as a Base and Launching Pad for Terror**

Institutionalizing Strategy for Long Term Success

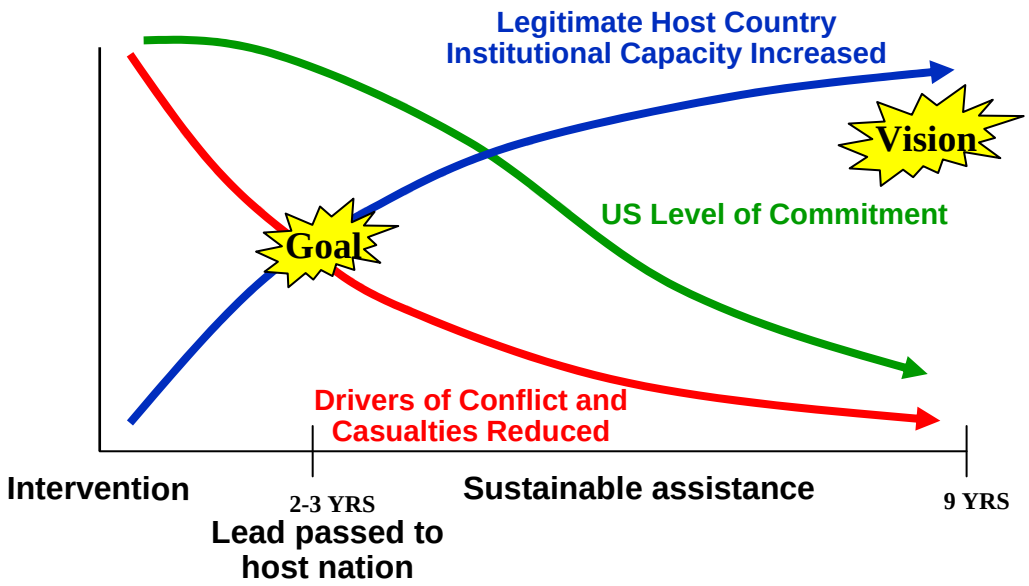
- **Establish/maintain international accountability**
- **Strengthen coalitions/partnerships**
- **Government architecture and Interagency collaboration**
- **Foster intellectual & human capital**

Examples:

- UN Security Council Resolutions, G-8
- Int'l Maritime Organization, NATO, EU, African Union
- DHS, DNI, NCTC, CIA, SOF, transformational diplomacy
- National Security Language Initiative, Culture of Preparedness

How are we Doing?

Conflict Transformation*



We are making measurable progress in the War on Terrorism—but it will take sustained assistance and perseverance to build legitimate and effective governance to counter extremism

Iraq in Transition

March 2005	May 2006
• Transitional Government	• Democratic Government
• Drafting Constitution	• Ratified Constitution
• ISF – MoD: ~ 67,000	• ISF – MoD: ~117,900
• ISF – MoI: ~84,000	• ISF – MoI: ~145,500
• US Forces:	• US Forces:
– 17 Combat BDEs	– 15 Combat BDEs
– ~146,000	– ~131,000
• Coalition Forces: ~23,000	• Coalition Forces: ~20,000
• Bases under ISF Control: 7	• Bases under ISF Control: 34
• Bases under US Control: 121	• Bases under US Control: 76

Support for Bin Laden, Violence Down Among Muslims, Poll Says

By Robin Wright
Washington Post Staff Writer

Image Of U.S. Falls Again

International Herald Tribune
June 14, 2006

By Brian Knowlton

Captured papers show weakening insurgency

By PATRICK QUINN, Associated Press Writer
Thu Jun 15, 10:40 PM ET

U.S. Efforts to Combat Terrorism

Protect and defend the Homeland and U.S. interests abroad
Terrorist Surveillance Program (post 9/11)
FBI mandate to Prevent Terrorist Attacks (2001)
PATRIOT Act (2001)
Department of Homeland Security (2002)
National Strategy for Homeland Security (2002)
National Strategy for Physical Protection of Critical Infrastructure and Key Assets (2003)
Transportation Security Agency (2003)
Terrorist Screening Center (2003)

Attack terrorists and their capacity to operate effectively at home and abroad
Nearly 2/3 of senior al-Qaeda leaders killed or captured
Terrorist cells disrupted in Italy, Saudi Arabia, Singapore, USA, Yemen
3,000+ al-Qaida associates detained in 100+ countries
Pakistan detained 500 suspected Taliban and al-Qaida operatives
Terrorist leaders arrested in Hong Kong, Indonesia, Malaysia, Philippines

AQ "golden chain" broken (2002)
- 166+ countries freeze terrorist assets worth ~$140 million in over 1,400 accounts

Operation Enduring Freedom (2001)
- destroyed terrorist training camps
- dismantled Taliban regime
- denied terrorist safe haven

Operation Iraqi Freedom
- Zarqawi killed (2006)

Proliferation Security Initiative (2003)
Disrupted AQ Khan WMD network (2006)

Support mainstream Muslim efforts to reject violent extremism
Public Diplomacy efforts
Elections in Afghanistan(2004)
Tsunami assistance in SE Asia (2004-2005)
Earthquake relief in Pakistan (2005)
Elections in Iraq (2005)

Policy Initiatives
National Strategy to Combat WMD (2002)
National Strategy to Secure Cyberspace (2003)
National Counterterrorism Center (2004)
Director of National Intelligence (2005)
NSPD-15/HSPD-46 (2006)
National Implementation Plan (2006)
National Strategy to Combat Terrorist Travel (2006)
National Strategy to Combat Terrorism (2003/2006)

Raytheon

Customer Success Is Our Mission

Joint Approach for Target Management for the Precision Strike of Time Sensitive Targets

Raytheon Network Centric Systems

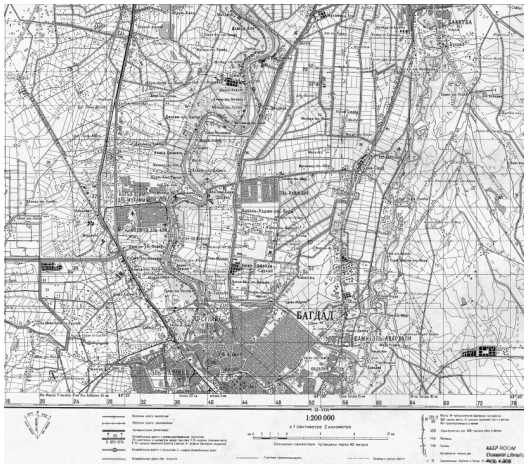
Michael J. Woitalla

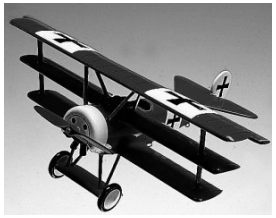
Sean M. Beary

17 October 2006

What is a “Target” ?

- The term “Target” is an overloaded word
- Joint Publication 1-02 defines a target as:
  1. *A geographical area, complex, or installation planned for capture or destruction by military forces.*
  2. *In intelligence usage, a country, area, installation, agency, or person against which intelligence operations are directed.*
  3. *An area designated and numbered for future firing.*
  4. *In gunfire support usage, an impact burst which hits the target.*





Definition variance inhibits the cooperative targeting process

Disjointed “Joint” Targeting

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- Higher echelon Commanders typically see strategic and deep targets, but these typically do not include lower level tactical targets unless specifically pushed to them
- No single targeting repository exists to provide the commander with a complete battlespace-wide SA view of both strategic and tactical targets
- Increasing number of Joint operations forcing increasing need for a common understanding of Targets and the Targeting process
- Separate methodologies that are process-centric and service unique

Precision Requirements Compound the Problem Space

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Precision Requirements Compound the Problem Space

Current / Historical View

- Multiple Stovepiped Systems Procurement:
  - TBMCS (Theatre Battle Management Core System)
  - JTT (Joint Targeting Toolkit)
  - AFATDS (Advanced Field Artillery Tactical Data System)
  - ADOCS (Automated Deep Operations Coordination System)
  - GCCS (Global Command and Control System)
  - C2PC (Command and Control PC)

- Different systems maintain target data in their own unique formats and unique identifier in accordance with varying methodologies

- Sharing Target Data Requires the use of push interfaces:
  - Message formats (eg USMTF, JVMF)
  - Cursor on Target
  - Point to Point Interfaces

No "Common" Target Understanding

Future / Desired State

- Common and more complete targeting SA accessible across the battlespace via NCES/GIG

  "…empowerment comes from enhanced information and decision support capabilities to maintain situational awareness and the ability to plan, execute, monitor, and assess joint and multinational campaigns and operations throughout the spectrum of conflict."

  --*Net-Enabled Command Capability CDD*

- Opportunity to pass targets between other independently developed software services migrated from Current Force systems

- Rich environment for:
  - –Cross service communication and understanding
  - –Reduced battlespace ambiguity
  - –Enhanced cross service target prosecution
  - –Enforcing commander's target proponency policies

- Central point to access additional target prosecution systems as they become available (lethal and non-lethal systems)

Other Attempts

- Standard Messaging Formats
  - JVMF
  - USMTF
  - OTH-GOLD
- MIDB - Modernized Integrated DataBase
- JCDB - Joint Common DataBase
- CoT - Cursor on Target
- C2IEDM / JC3IEDM - Command and Control Information Exchange Data Model / Joint Consultation Command and Control Information Exchange Data Model

Either too generic or too specific

JTM – an overview

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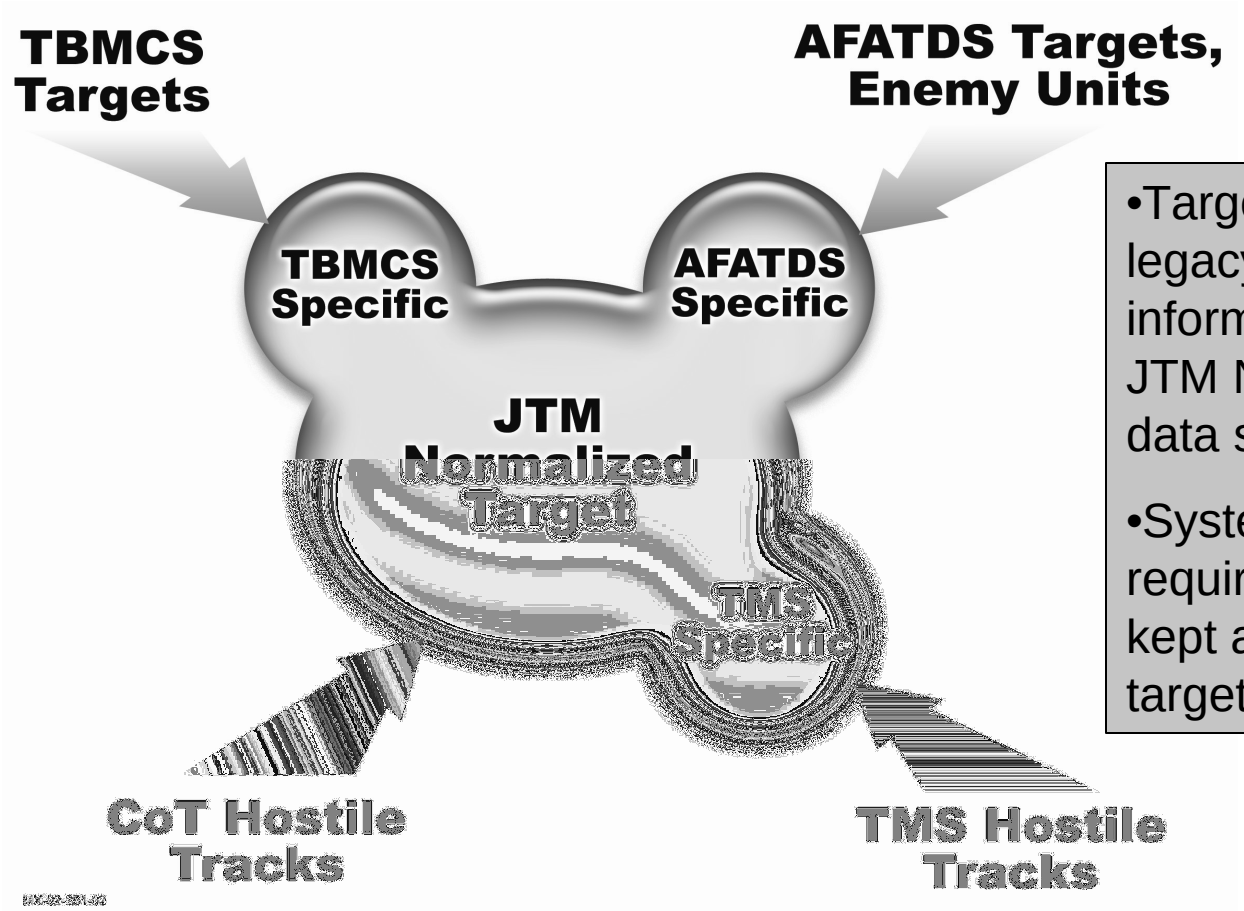
- Joint Target Manager (JTM) embraces cited NECC targeting capabilities.
  - Provides a centralized common target representation and repository.
  - Specialized external system data is maintained
  - Targeting Folders and “non-structured” data association assists with target development
    - Can contain targets, other target folders, or attachments
  - Target List Management
- JTM provides a Web Service Interface and portal access
- Data Distribution enabling enterprise-wide SA
- Visualization application via the C2PC / JCTW

NECC Pilot System from a “Go to War” Capability

Merged Target Data Schema



- Targets are harvested from legacy systems and the information is mapped to the JTM Normalized Target (JNT) data structure.
- System-specific information required for communications is kept along with the normalized target structure

Unique target identifiers are created for all JTM targets. Identifiers for all systems are also kept so that the user can easily refer to a target with the operator of another system. This also aids target correlation.

JTM Benefits

- Information Sharing:
  - Maintenance of Detailed External Source Data
  - Target Data Distribution
  - Web Service Interface for External Consumers
  - Non-Structured Target Data Association and Aggregation
  - Broader access to targeting information from tactical to strategic
  - Single service providing targeting data across battlespace

- Information Understanding:
  - Normalized Target Data Model
  - Non-Structured Target Data Association and Aggregation
  - Broader access to targeting information from tactical to strategic
  - Maintenance of Detailed External Source Data

- Targeting Process Enhancement:
  - Access to Effects Delivery Execution Functions
  - Legacy Targeting System Integration
  - Broader access to targeting information from tactical to strategic
  - Single service providing targeting data across battlespace

Disjointed “Joint” Targeting

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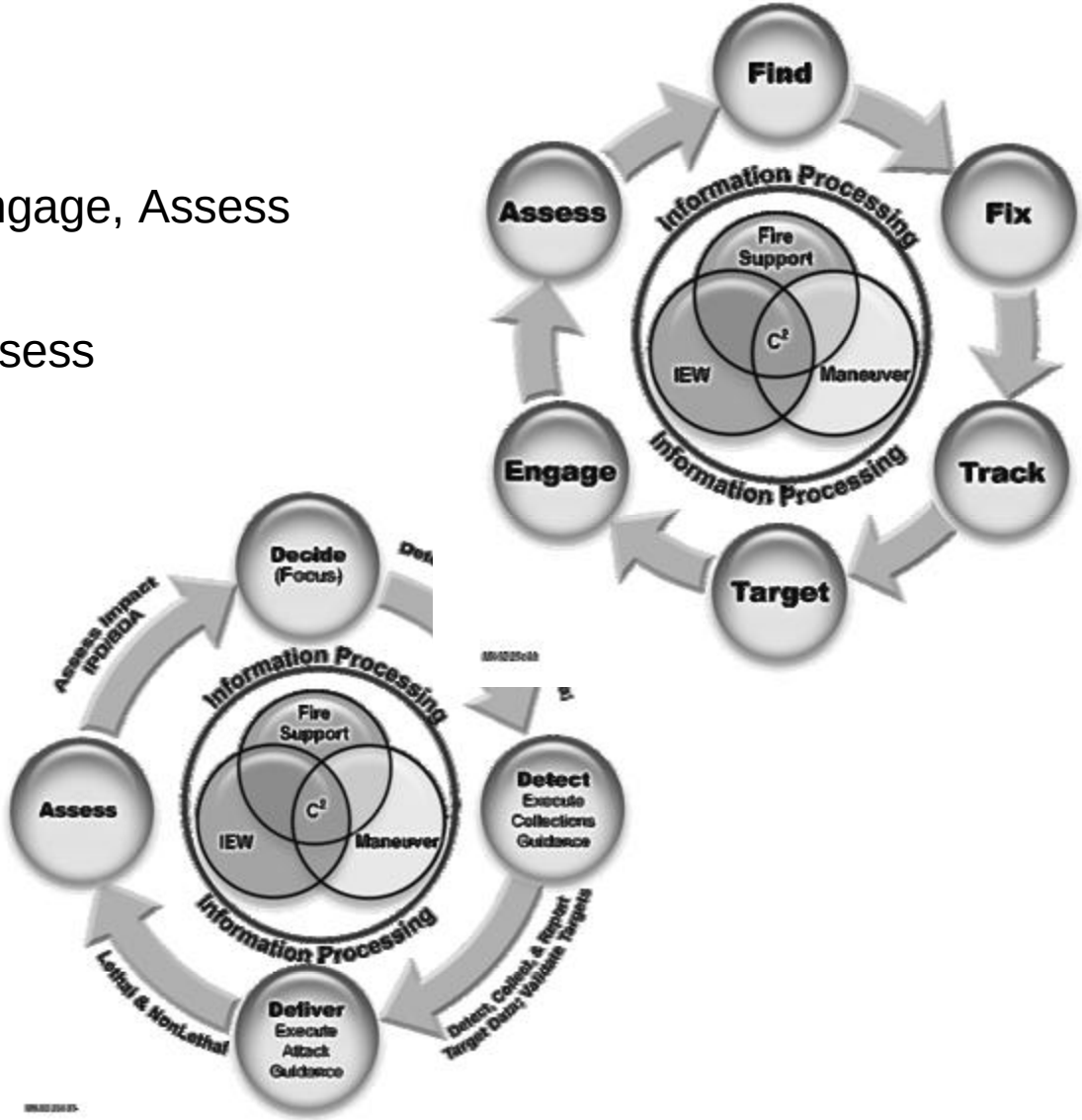
Precision Requirements Compound the Problem Space

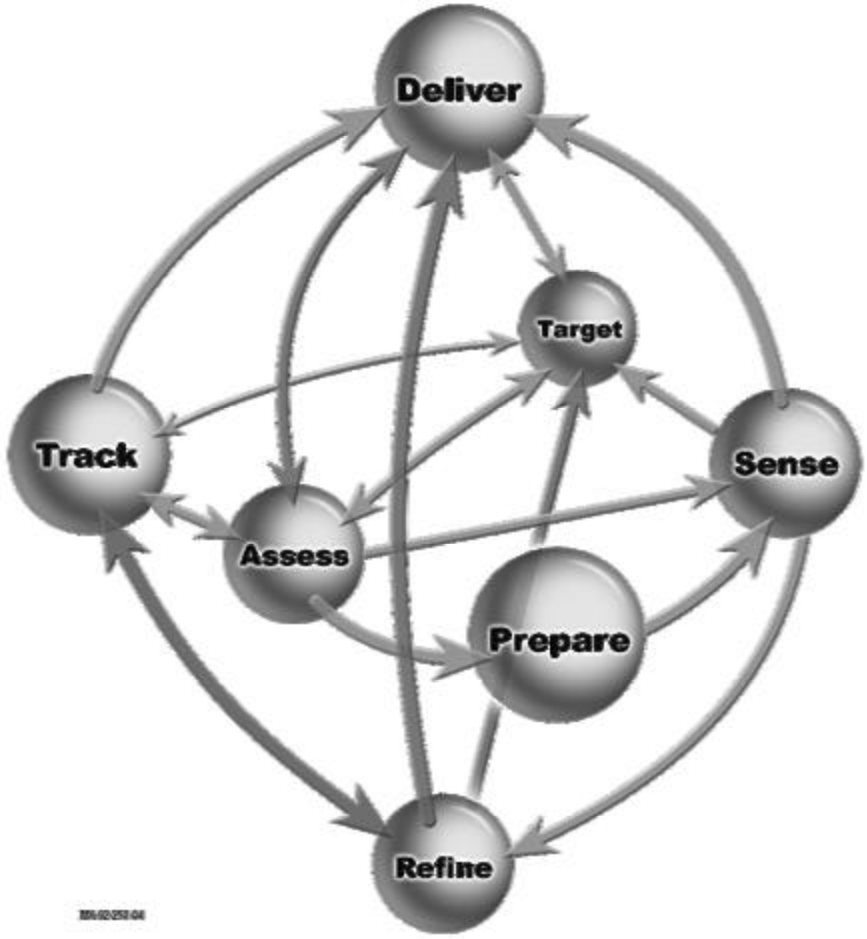
Targeting Processes

- Two methodologies
  - F2T2EA
    - Find, Fix, Track, Target, Engage, Assess
  - D3A
    - Decide, Detect, Deliver, Assess
- Both are:
  - *Serial*
  - *Process Oriented*
- *Neither are:*
  - *Net-centric*
  - *Capabilities Focused*



Net-Centric Targeting Model

- All nodes are created equal
- Supports current targeting thread
  - Capabilities focused
  - Takes advantage of netted capabilities
- Events can happen concurrently
- Bi-directional information flows
- Supports TST as well as deliberate planning
- Strategic and Tactical
- Incorporates D3A and F2T2EA methodologies



Targeting model, not methodology!

Future Work

- Embrace NCES infrastructure
  - Communications
  - Security/Information Assurance
  - Data Store
- Enrich semantic understanding of metadata attached to unstructured data
  - Enable searching and automatic retrieval
- Enhance coalition interoperability
- Increase legacy system interoperability in net-centric environment
  - Utilize available target mensuration services to streamline kill-chain
- Work with warfighter to develop/embrace net-centric operations, methodologies and doctrine
  - Utilize technology on hand

Evolving Capabilities for Evolving Needs

Summary

- Urgent Need for:
  - Common Target SA
  - Normalized Joint Targeting Data schema
  - Utilization of Non-structured Data
  - Incorporation of Intelligence Data
  - Bridging Intelligence and Effects community
- Initial work shows promise
  - Migration from CoT, JTLM, TSA
  - JTM Normalized Target Approach
  - Joint Services are all partners in development
  - SOA migration, demonstrating in NECC Pilots
- More Work is Needed
  - JC2 / NECC
  - NCES
  - Working with the services to redefine doctrine/TTPs

Working to be a force multiplier

Backup Slides

JTM Background

- JRAE 05 (Joint Rapid Architecture Experiment)
  - Shared targeting data between services
  - JTLM (Joint Target List Management)
    - Common Target Schema
    - URI pointers back to source systems of record

- TSA (Targeting Situational Awareness)
  - Addressed the need for associating “non-structured” targeting data with targets
  - Coalescing multiple target data sources

- JTM (Joint Target Manager)
  - Endorsed by all services (truly Joint)
  - Merged JTLM and TSA capabilities
  - Enhanced target folders and “non-structured” data
  - Increased target data sources
  - First attempt at target data normalization
    - Still maintains specialized target data from external data sources (TBMCS, AFATDS, etc.)

JTM Architecture

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